RAILROAD GAZETTE

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The Death of Krupp.

Friedrich Alfred Krupp died of apoplexy at his home at Huegel on the afternoon of Nov. 22. As all the world knows, he was the head of the great institution known officially as Fried. Krupp, much the greatest steel works in the world. Of this vast establishment His Excellency, Friedrich Alfred Krupp, was not only the chief, but he was the sole proprietor. The concern is managed by a Board of Managing Directors, at present numbering 14 members, who are appointed by the owner. Twelve of them live at Essen, one at Magdeburg, and one at Kiel. Of these two, one presides over the Board of Directors of the Gruson Works and the other over the Board of Directors of the Germania Ship Yard, the latter being at Kiel.

The founder of the Krupp house, Peter Friedrich Krupp, was born in 1787 and died in 1826. In 1810 he established the house known ever since as Fried. Krupp, and in 1811 built his first furnace for making cast steel. The next head of the house was Alfred Krupp, who was born in 1812 and died July 14, 1887. Six years after the birth of Alfred Krupp the oldest workshops now existing at Essen were built, and in 1848 Alfred Krupp became the sole proprietor. Meantime, some progress had been made in the application of cast steel to small arms and to cannon, and in 1853 the manufacture was begun of weldless steel tires. The work then went on in several directions, and a 50-ton hammer was installed in 1861, and in 1862 the first Bessemer converter was started. In 1864 the rail and plate mills were built.

Friedrich Alfred Krupp succeeded to the ownership and to the control in 1887 on the death of his father, at which time the works had grown to great magnitude. Open-hearth furnaces had been built and coal mines and ore mines purchased. The product had been diversified, including not only the most advanced war material, but also a great variety of industrial material. In 1890 the manufacture of armor plate was begun, and hydraulic forging presses of 2,000 and 5,000 tons were installed. In 1896 the management of the Germania Shipbuilding and Engineering works at Kiel and Berlin was taken over, and in 1902 it became the sole property of the house of Fried. Krupp.

On the first of last April the persons employed numbered to 43,083. Of these 24,536 were employed at Essen, 6,159 at various coal mines, 5,628 in the blast furnace plants, proving grounds, etc. A census taken in May, 1900, showed that the total number of persons connected with the works, including wives and children, amounted to 147,645.

The oldest specialty of the works is crucible steel, the largest blocks produced weighing up to 85 tons. This is used especially for guns, rifle barrels, armor piercing shells, various parts of engines, tool steel, spring steel, rolls, etc. The open-hearth output is large, and steel castings in great variety are made, both of crucible and Martin steel. These castings include railroad frogs, locomotive driving wheel centers, parts of ship frames and various engine parts. In fact, the variety of cast steel forms is very large. Puddled steel is also produced in considerable quantity, not only as raw material for the crucible steel, but for tires for gun carriages and a variety of lesser uses. Bessemer steel is produced in considerable quantity for rails, fish plates and structural material. Various other grades of steel are made, as for instance, chrome steel, nickel steel, etc.

The war material is famous, and up to Jan. 1, 1902, these works had delivered 39,876 cannon to various governments. They also make rifle barrels, projectiles, ammunition and armor plate. We regret that we are unable to find any reliable statement of the part of the Krupp product which goes into industrial uses. The war material has so large a place in the view of the general reader that the part of the output consumed in the arts of peace is seldom thought of. The American agent of the Krupp house thinks that it is probable that at least 70 per cent. of the total product is consumed for industrial purposes. A newspaper statement is that Mr. Krupp said that more than half of his product was for industrial uses. We should guess that this estimate must be too small and that Mr. Krupp was misquoted.

So many accounts of the great works at Essen have been written that it seems hardly necessary that we should go into any such account now. Mr. Krupp, who has just died, was a man of high character quite apart from his eminence as an iron master. He was a man of patriotism, and beneficence and cultivation, and did valuable work for his own people and for the Empire. It is said that he declined a title, preferring to be the first burgher rather than the last noble, but some years ago the Emperor gave him the courtesy title of Excellency. Last February he received the Bessemer Gold Medal from the British Iron and Steel Institute, but even then his health was too delicate to permit him to go to England, and he sent his cousin, Mr. Otto Eichhoff, in his place. In his letter to the President of the Institute he said that his medical advisers had absolutely forbidden him to leave the South at that time.

Locomotive Lubrication.*

Some years ago Mr. Chas. Miller, of the Galena Oil Company, realizing the vast amount of money lost to railroads through the negligence, carelessness or ignorance on the part of the engineers in the use of oil, proposed making a schedule, or, in other words, fixing a limit on the quantity of oil to be used per mile run, and with the aid of competent instructors to teach enginemen economy in its use. The efforts of Mr. Miller resulted in a saving of hundreds of dollars to the railroads. The principles introduced by him have since been carried out by the Traveling Engineers' Association, the spirit of emulation waxing so strong as to cause all to try to reach the limits as set by him, and in many cases to exceed them.

The point where true economy ceases and loss begins was entirely lost sight of in the effort to produce a set of fancy figures, which to the operating officials no doubt looked like a vast saving of dollars and cents, as represented by oil, but to the mechanical man often meant a direct increase of maintenance expense in cut journals, valves, valve seats and cylinders. Yet he dared not complain, as high mileage per pint of oil was the fad, and every fad must run its course. If the mileage of one road fell below that of its neighbors, the low man suffered by comparison.

The point desired to make is: Has not the spirit of emulation and comparison carried us too far? Have we not, in our endeavors to keep up our oil records, lost sight of the fact that our power is gradually growing larger and heavier, and that our steam pressure is increasing in the same ratio? Does this not mean more frictional area to lubricate, higher journal and piston speeds in one case, and an increased temperature with its resultant partial vaporization in the other? Let us look back about ten years. The average passenger engine was at most an 18 x 24 in. eight-wheeler, weighing about 62,300 pounds on drivers. At 30 miles per hour this engine would have a journal speed of 286 ft. per minute, and a piston speed of 584 ft. per minute, while the frictional surface of the cylinder traveled over by the piston in one minute would equal 2.745 sq. ft.; and last, but not least, a pressure of about 150 lbs., with a temperature of 365.8 deg. Fahrenheit. There is no reason why this engine should not make from 125 to 150 miles per pint of valve oil and from 40 to 50 miles per pint of engine oil; and you will find this class of engine still making that mileage. Compare this old style engine, however, with a modern passenger engine. Cylinders, about 21 x 28 in.; ten wheels, 67 in. in diameter, weight on drivers, 130,500 lbs. The journal speed of this engine, at 30 miles per hour, would be 373 ft. per minute, as against 286 ft. for the old style engine; a piston speed of 652 ft. and a frictional cylinder surface of 3.585 sq. ft. per minute. Can we reasonably expect this engine to run successfully on the same amount of lubricant as the former?

Our freight engines have increased from Consolidations rated at 600 tons capacity in 1896 to engines of 1,100 tons on same district in 1902. If the hauling capacity of the locomotive has been nearly doubled, is it not reasonable to suppose all other parts of the engine have increased proportionately? Yet we try to make the same mileage per pint of oil with the latter engine as with the former—not only try to, but actually do it. Cut driving journals and cylinders were at one time an almost unheard-of quantity. They are very common now. The metal is the same, if not better, than formerly, but our speeds, weights and frictional areas have all increased; consequently all should have more attention and, no doubt, more oil.

We can still run our engines on a limited quantity of oil if we care only to produce a fancy oil sheet, but if we desire true economy we must take all factors into consideration—speed, weight and pressure—or we save at the spigot to waste at the bung. With all modern appliances it costs about $20 to drop one pair of drivers, turn the journals and refit the boxes. This $20 would buy about 70 gallons of engine oil, or enough to oil the entire engine two months, making 150 miles a day. It will take two days to do this work. Now, if the engine should happen to be laid up for this during the busy season, and a further loss to the company, estimating the earning capacity of the engine at $200 a day, would be $400, or enough to pay for oiling the engine for four years. To bore and bush the cylinder of a 22 x 28-in. engine costs about $68. At 50 cents a gallon this would purchase 136 gallons of valve oil, or enough to oil the engine 392 days, making 150 miles per day, and buf 50 miles per pint of valve oil. It takes three days to bore and bush a cylinder. At $200 a day earning capacity, this would, in busy times, result in a further loss of $600, or enough to buy 1,200 gallons of valve oil, which would oil the engine 3,200 days, or nearly ten years. To reverse the proposition: If you were to cut the oil supply to its lowest limit, it would take four years to save enough on engine oil to pay for one cut journal, and ten years on valve oil to pay for one cut cylinder.

Of course, we can not claim that all cut journals or cylinders are due to mileage limit per pint of oil being set too high, as both have been known to occur where the oil allowance was very liberal. Yet, on the other hand, it is hard to believe that a perfectly lubricated journal or cylinder will cut, unless some abrasive finds its way between the bearings.

We are told to limit the feed of lubricator to five drops a minute. To show the inconsistency of this method of lubricating, we will assume that two engines of similar proportions are sent out—one on fast freight, 30 miles an hour; one on local, ten miles an hour. The first engine would, then, receive 100 drops of oil in ten miles, while the second, 300 drops. Yet in the first case the piston speed is 705 ft. a minute, while in the latter but 235 ft.

Indicator cards, showing the difference in effective work performed by the locomotive with valves perfectly lubricated and with valves but partially oiled, were taken. The loss in power in two different cases was equal to 15.28 per cent. and 10 per cent. respectively. The first engine was rated at 1,075 tons. Ten per cent. of this would be 107.5 tons. At 20 cents per ton per 100 miles, the direct loss would be $21.50, or enough to buy 43 gallons of valve oil, and we are not taking into consideration the loss due to the increased amount of coal required or overtime which would probably ensue, due to slow speed. The proper way to fix an oil limit is by the indicator, or, in its absence, by the cylinder area. Where the oil limit is too low an extra pint of valve oil, costing about 6 cents, will save a ton of coal costing $1.50.

In a visit to a certain roundhouse lately, six engines were noticed with cylinders split wide open, in most cases due to pistons seizing on cylinder walls. Some years ago common engine oil was considered a good lubricant for a main pin. Then, gradually, we began to use valve oil; the engine oil would no longer keep it cool. We are just as gradually coming to dope or grease.

Prof. W. F. M. Goss, of Purdue University, in a paper* entitled "Possibilities in American Locomotive Design," says: "In the American practice the two main rods of a modern engine must be designed so that each will transmit from 800 to 1,000 horse-power. That this may be accomplished, rods have become enormously heavy and crank pins have grown to be as large as axles were ten years ago. Moreover, the forces to be transmitted often exceed the ability of the fixed portions of the machine to withstand properly, hence, parts strain, journals and brasses fit badly, and hot pins and boxes result." This is why we gradually took to dope. Ten years ago the crank pin took a maximum strain of 1,645 lbs. per sq. in.; to-day it takes 2,050 pounds. Four hundred pounds' increase per sq. in. is a whole lot, but the entire engine has increased in proportion. The use of dope saved our pins, but, sad to say, we can't use dope in cellars or cylinders.

Let us, then, study out the real remedy to apply to effect true economy. Figure out by cylinder areas, etc., the actual oil required to thoroughly lubricate all parts. Use plenty of oil, but not wastefully. Put the oil in the right place, be it cylinder or cellar. Cast oil cups on the cellars, if necessary, but by all means make them get-at-able, and also fulfil their proper functions, viz., to act as a receptacle for packing and to prevent the box from closing. Wash the boilers often enough to prevent foaming. Teach the men that they can go further on a half a boiler of water and lubricated valves than on a full boiler with dry valves. That pouring engine oil on a smoking journal is simply a waste of oil. Use a good, spongy packing for all cellars, and a packer who will take the cellar down and pack it right, and not try to pack it through the spokes with a piece of baling wire. And, last but not least, when making an oil schedule, use ordinary horse sense, and know that the allowance is ample, and then compel your engineers to use ordinary horse sense in its application.

*Abstract of a paper presented to the Rocky Mountain Railway Club, Nov. 22, 1902, by Mr. F. P. Roesch, Traveling Engineer, Colorado & Southern.

Railroad Gazette, Oct. 17, 1902.

The Electric Railroads in New Jersey.*

BY E. BJERREGAARD.

For some years there has been talk of joining New York City and Philadelphia by trolley. This has been accomplished but a passenger must use the cars of seven different companies and change cars nine times and take more than eight hours for the trip from Jersey City to the ferry in Camden, provided no time is lost in making connections. The fare will be less than half that of the steam roads.

The accompanying map shows these roads and also the other electric railroads in New Jersey. It will be seen that most of the electric roads are in the northeastern part of the State, and practically all of these are controlled by the same interests—the Shanley-Young syndicate. The largest system of trolley roads owned by this syndicate is the North Jersey Street Railway, owning or controlling 240 miles of track. The next largest is the Jersey City, Hoboken & Paterson Street Ry. of 140 miles.

The North Jersey Street Ry., an operating company, was incorporated in 1894, and owns the entire stock ($1,500,000) of the Newark & South Orange Railway. In 1898 it leased the Consolidated Traction Company of New Jersey for 999 years, guaranteeing dividends on $15,000,000 of stock beginning at 2 per cent. in 1899, and continuing up to 4 per cent. in 1906, and thereafter. There is now talk of consolidating all the roads in the northeastern part of the State. The controlling interests in the North Jersey include A. J. Cassatt, Thomas Dolan, William L. Elkins, P. A. B. Widener, John D. Crimmins, Geo. F. Perkins, E. F. C. Young, David Young and others.

At the annual meeting of the North Jersey last spring, it was announced that plans had been made for extensions and improvements to cost $1,000,000, made necessary not only because of constantly increasing traffic, but also because of increased demands that will be made on the system when connection is made with the tunnel from Jersey City to New York. This tunnel is the project abandoned some years ago after some 4,000 ft. had been finished. Work is again going on by a new company backed by electric railroad people.

Newark, the largest city in the State, with a population of 246,700 (census of 1900), and Jersey City second with 206,433, are both well supplied with local trolley railroads, all controlled by the Shanley-Young Syndicate. Our map is on too small a scale to show the roads in the cities. Beginning at the Pennsylvania Railroad station in Jersey City, the first interurban road of the North Jersey, runs through Greenville to Bergen Point, 9½ miles, with two branches at the extreme end.

The two roads across the meadows between Jersey City and Newark belong to the North Jersey. The most northern of the two is known as the "Turnpike Road," and it is used mainly as a feeder for the lines running north from Newark. The southern road over the meadows is known as the "Plank Road," and the cars run from Jersey City, through Newark, to the Milburn township line near Wyoming and Maplewood, 14 miles. Tickets to be used on these two lines may be bought in New York and be used via Pennsylvania Railroad ferry at Cortlandt street.

In Newark, where there are about three times as many miles of line as in Jersey City, many of the roads that run into the suburbs pass Broad and Market streets, the business center of the city. There are really two lines to Elizabeth. The most direct is seven miles long and transfers to the road to Plainfield. One of the oldest and best paying lines of the North Jersey is the seven-mile road to West Orange, at the foot of the Orange Mountains. At West Orange and also at Eagle Rock this road meets the Orange & Passaic Valley Railway.

Another important line is that along South Orange avenue from Ferry street, Newark, through Vailsburg to South Orange, 6½ miles, where it turns south and runs along the east base of the Orange Mountains, 2½ miles further, to Maplewood, to meet the road through Irvington near Wyoming.

Another line from Broad and Market streets is that through Bloomfield, Montclair and over the mountain to Caldwell, making 10 miles of double-track road, and a popular route for trolley excursions in the summer time. In Montclair there is a local road 6½ miles long running north on Valley Road to Montclair Heights, and south on Elm street from the main line, to the West Orange Township boundary line.

All the lines in Newark belong to the North Jersey Street Ry. At the junction of Broad and Market streets transfer can be made to almost any other line, and as pretty nearly all interurban lines pass there, these lines handle the local traffic. There is a road beginning in Clinton Township, two miles southwest of Newark, and running through the entire length of the city, north to Woodside and Belleville, making seven miles. A short line is from the Pennsylvania station, four miles through the city to Forrest Hill.

There are two roads extending to the north out of Newark, one on each side of the Passaic River, the most important of which is the Newark, Passaic & Paterson Joint Line of the North Jersey Street Ry., and the Jersey City, Hoboken & Paterson Ry. through Passaic to Paterson, 15 miles, double-track. From Passaic to Paterson the road is owned by the J. C., H. & P. The road on the east side of the river is six miles long and joins the Newark & Hackensack Traction at Arlington. From Arlington the Newark & Hackensack runs to Hackensack, 12½ miles from where it meets the North Jersey. In Hackensack the Newark & Hackensack connects with the New Jersey & Hudson River Ry. & Ferry Co. (mentioned below.)

We have seen that there are three roads from Newark to the foot of the Orange Mountains. There are two independent roads operating in the valley. The Orange & Passaic Valley Ry. is a seven-mile road from Brookdale, just north of Bloomfield, to East Orange, where it turns west to West Orange, then south to Orange Valley. At West Orange transfers are given to its 2½ mile branch to Eagle Rock. The South Orange & Maplewood Traction Co.'s line is about three miles long between West Orange and South Orange.

The Jersey City, Hoboken & Paterson Street Ry. operates 140 miles of road in Hudson, Bergen and Passaic Counties, and has 12 miles under construction. It is the second largest system in the State. It connects with the North Jersey Street Ry. and operates over some of its tracks in Jersey City, and also connects with the same company in Passaic. It connects with the New Jersey & Hudson River Ry. & Ferry Co. at Fort Lee, and with the Newark & Hackensack Traction at Rutherford. Its main line, which runs to Paterson, the third largest city in the State, begins at the ferry in Hoboken and is called the "White Line." It crosses the meadows via Secaucus on the "Paterson Plank Road." At East Rutherford a one-half mile branch is run to Rutherford. An eight-mile branch is from Passaic to Lodi.

Continuing through Passaic the "White Line" runs on the north side of the Erie Railroad to Paterson, 20 miles from Hoboken, usually done in 1 hour, 30 minutes. All the roads in Paterson are controlled by the J. C., H. & P., and branches are run eight miles to Singac and shorter distances to Totowa, Haledon and to Riverside. A branch is building to the Passaic River on the east, to connect with the line of the New Jersey & Hudson River Ry. now building from Maywood. A branch will be built north to Mahway, by the Paterson & State Line Traction Co., of which Preston Stevenson is President. He has some franchises for his proposed 12 mile road.

The J. C., H. & P. operates the only road between Jersey City and Hoboken. Besides the lines that begin at the ferry and Lackawanna station in Hoboken, it has lines running from the Pennsylvania and Erie Railroad ferries in Jersey City, the Fourteenth street ferry in Hoboken, and the Forty-second street ferry in Weehawken, connecting with pretty nearly all the other of its lines in Hoboken, Jersey City and Jersey City Heights. There are three lines running north and south on the Heights. One to the race track at Guttenberg, six miles; another goes through Weehawken to Fort Lee and a little beyond, 7½ miles. These roads passing through the different streets in Hoboken supply the local service. In Fort Lee connection is made with the road running to the ferry there.

There is a branch of the J. C., H. & P. almost ready for operation from Summit avenue, Jersey City Heights, through New Durham and Ridgefield to Hackensack, 12 miles. Later it will be extended to Cherry Hill, two miles farther. Track is laid most of the way and new bridges built across Peck Creek and Hackensack River, but there are four railroad crossings and one railroad bridge which cannot be crossed. The company operates about 400 cars, both open and closed, some of which are 32 ft. long from sill to sill, but it has found that cars 25 ft. long are best adapted to its use. At Newark the North Jersey Street Ry. Co. is enlarging its power plant at a cost of $250,000, and the J. C., H. & P. is building a similar one at Secaucus, on the Hackensack Meadows, outside of Jersey City.

The New Jersey & Hudson River Railway & Ferry Co. operates a ferry on the Hudson from the foot of West 130th street, New York, to Edgewater, where its trolley road begins. There are 15 miles of single track road in operation, and five miles building to Paterson. The main line, as shown on our map, is nearest the river and runs north to Fort Lee, and turns west to Leonia, Hackensack and Maywood, and it is expected to have cars running to the center of Paterson soon by using the tracks of the J. C., H. & P. from the Passaic River. There is a branch from Leonia to Englewood, and this will soon be extended to Nyack, N. Y. The company has a reserve of $300,000 from a bond issue, to make other extensions and improvements.

The Elizabeth, Plainfield & Central Jersey Ry. main line runs from Elizabeth (where connection is made with the Newark line of the North Jersey) 14½ miles to Plainfield, paralleling the Central R. R. of New Jersey, through Roselle, Cranford and Westfield. In Elizabeth it has a line beginning at the terminal of the Staten Island Ferry (Elizabethport) running through Elizabeth and out to Elmora, the intersection of the dividing line between the townships of Cranford and Union. There is talk of a road from Elizabeth to Springfield or Summit for the future.

Between Westfield and Garwood there is a branch connecting at Rahway Junction, where the car barns and operating offices are located, running to the Lehigh Valley tracks at Picton, where a crossing is not yet made, then continuing on to Woodbridge and Boynton Beach, 12 miles from Westfield.

In Plainfield the city is pretty well covered. A line runs from Netherwood four miles south to Dunellen, another crosses the city from east to west. The total mileage of the E. P. & C. J. is 64, five miles of which is an extension, built during the last year; the other properties were either built or acquired in 1900. A new power station is being built at Cranford for the line between Plainfield and Elizabeth. At Dunellen, four miles south of Plainfield, connection is made with the Middlesex & Somerset Traction Co. to Bound Brook, four miles, and west to Raritan, six miles more.

From Bound Brook the Middlesex & Somerset Traction Co. follows along the north bank of the Raritan River, east seven miles, to New Brunswick, crossing the river, and running through Milltown to South Amboy, 15½ miles, paralleling the steam road. It is at Milltown, four miles southeast of New Brunswick, where the Trenton & New Brunswick Railroad, just finished from Trenton, will connect, traffic arrangements having been made. The Middlesex & Somerset Traction Co., in all, operates 50 miles of road. It also has a road 8¼ miles, a roundabout way through Bonhamtown to Metuchen, to connect with the Raritan Traction Co., whose road is eight miles long and reaches Boynton Beach through Perth Amboy. The Middlesex & Somerset is now taking steps to double-track its line between New Brunswick and Bound Brook, and is putting in several miles of rock ballast on other lines and making material changes in cutting of grades and reducing curves.

Work was begun last March on the Trenton & New Brunswick Railroad, which is the connecting link between the trolley roads in north and south Jersey. The road starts at the end of the Wilbur Line of the Trenton Street Railway at the Inter-State Fair Grounds, outside of Trenton, and runs 23 miles to Milltown, where it joins the Middlesex & Somerset, over which line it runs its cars into New Brunswick. At the Trenton end the gages of the roads are different so passengers must be transferred. The Railroad Construction Co., of Philadelphia (W. A. Stern, President, and I. H. Silverman, Vice-President), built the road, which is on private right of way 100 ft. wide, fenced in with wire and well ballasted, and laid with 60-lb. T. rail. The grade is from 1 per cent. to 1½ per cent., and (north of Hamilton square) for 16 miles there is not a curve in the line. Some big fills and cuts were made near the upper end of the road and one large concrete culvert built. An overhead crossing was made at the Pennsylvania tracks at Dayton.

The road parallels the Pennsylvania Railroad for nearly the entire distance, but there are no important towns on the line. Freight and express matter will be carried as well as passengers, and according to the preliminary time-table the run from New Brunswick to the Fair Grounds at Trenton will be made in 1 hour 15 minutes. The run of 23 miles on its own track will take 57 minutes, and this is expected to be reduced by 15 minutes.

We show one of the cars built by the Niles Car & Manufacturing Co. for this road. They have Peckham high-speed trucks, No. 26, and Christensen air-brakes with air whistles. These cars are intended and designed to stand severe service and high speeds, and are known as the Niles' Car & Mfg. Co.'s "Standard Interurban High Speed" car. The motors are General Electric Co.'s G. E. 57, and there are four to each car. Stops will only be made on signal from Hamilton Square to Milltown, and the fare for the round trip between Trenton and New Brunswick will be 80 cents, one-half the steam road rate, provided tickets are bought from the agents at any of the stopping places. When tickets are bought transfers will be given for use at both ends. The power house is near the Millstone River, about two miles from Princeton Junction, and the delay in finishing it has postponed the opening of the road, which was done on Nov. 3.

It will not be long before a road will be built on toward Jersey City. Surveys have been made from New Brunswick for a straight line to Elizabeth, and the Hon. Frank Bergen, of Elizabeth, has organized the East Jersey Traction Co., having in view a road from Elizabeth to Rahway, about 5¼ miles, paralleling the Pennsylvania Railroad on the south side.

The places where cars must be changed for the trip by electric railroad between New York and Philadelphia are given below with distances and approximate time. No allowance is made for time lost to make connections.

New York—Philadelphia.

Places.	Miles.	Time.
New York City	..	..
Jersey City (via ferry)	1	10 min.
Newark	8	48 "
Elizabeth	7	30 "
Plainfield	14½	1 hour 15 "
Dunellen	4	22 "
Bound Brook	4	24 "
New Brunswick	7	45 "
Fair Grounds, Trenton	23	1 hour 15 "
City Hall, Trenton	5	26 "
Camden	37	2 hours 44 "
Philadelphia (via ferry)	1	10 "

The fare from New York to Philadelphia via this route will be $1.20, or less than half the regular fare of the steam roads.

In Trenton the local roads are known as the Trenton Street Ry. The total length is 45 miles of track and besides the city lines, there is a road extending southeast to White Horse and Yardville, five miles, and another northeast through Lawrenceville to Princeton, 12 miles. The Trenton, Pennington & Hopewell Street Ry., an auxiliary of the Trenton Street Railway Company, will build about 12 miles of line extending from Mercer Driving Park, the northern terminus of the Tren-

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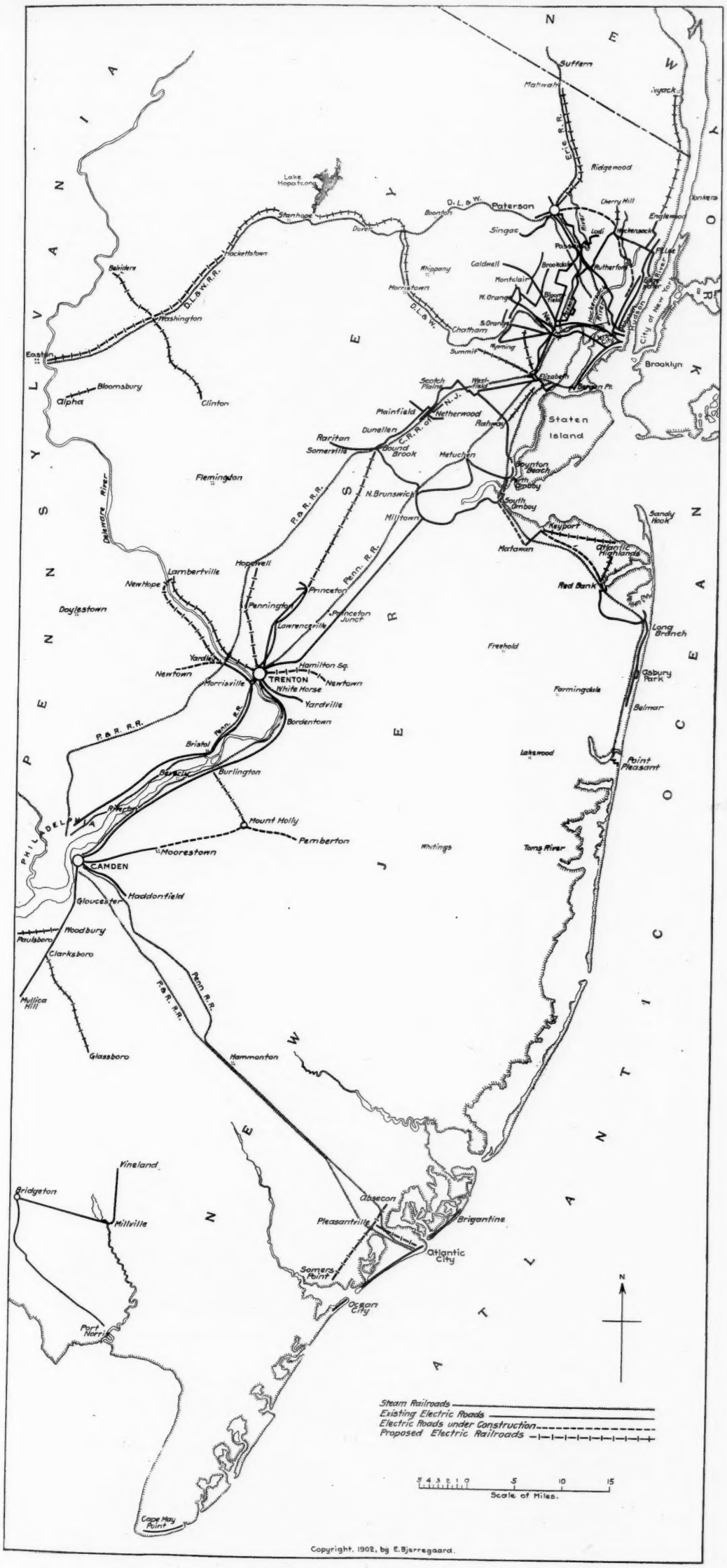

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The Electric Railroads of New Jersey.

Note.—This sketch map shows only such steam roads as are paralleled by electric roads.

ton Street Railway Company's line, to Pennington and Hopewell Boroughs. It is understood that the line will be built early next year. The Trenton Street Railway has $248,000 of authorized bonds in its treasury which will be used for future extensions.

The so-called Johnson Syndicate, of which much was heard, has not accomplished much in New Jersey. The death of Albert L. Johnson caused a halt in carrying out his plans for a New York and Philadelphia electric railroad. Mr. Johnson died July 2, 1901. Since then Robert E. Wright has been elected president of the Lehigh Valley and Philadelphia & Lehigh Valley Traction Companies, with John B. Hoefgen as the nominal head of the Trenton, Lawrenceville & Princeton, and the Yardley, Morrisville & Trenton Railroads. C. M. Bates is Secretary and Treasurer for the Johnson roads.

Mr. Johnson had surveys made from Melrose, Philadelphia, to Trenton, Princeton, Bound Brook and toward New York. He bought the upper Delaware Bridge between Trenton and Morrisville and proposed using it in connection with his through line to New York. He also bought considerable property for terminals. A number of charters were taken out, the principal ones being the New York & Philadelphia, and the Philadelphia & Lehigh Valley railroad companies. Some were steam railroad charters. The New York & Philadelphia Railroad company was not intended to build the real line between the two cities, but was intended to provide a means for condemning 100 or more properties in Trenton.

The Johnson Syndicate's properties in addition to the bridge are as follows: The Trenton, Lawrenceville & Princeton Railroad, extending from Princeton to Trenton: the Newtown & Yardley Street Railway, extending from Newtown, Pa., to Yardley, Pa., a distance of about five miles, which road is not yet finished; the Yardley, Morrisville & Trenton Street Railway, a road extending from the end of the tracks of the Newtown & Yardley, in the Borough of Yardley, Pa., to the Trenton end of the Trenton City Bridge, a distance of about 5½ miles. This road and the Trenton, Lawrenceville & Princeton have been in operation for some time.

When Mr. Johnson and his colleagues bought the Trenton, Lawrenceville & Princeton it was operating, or rather, building under a steam railroad charter. It was extended into Princeton after his death, and is now being extended to the heart of Trenton under a franchise granted by the city of Trenton, Oct. 21, 1902. It is operated by both steam and electricity on private right of way. High-speed electric cars are run from the northern part of Trenton to Princeton, 12 miles, in 30 minutes, and the fare is 10 cents. The line is entirely fenced in, cattle guards at the crossings, and steel bridges with concrete piers are used throughout. The steam locomotive hauls the freight, and, before duplicate machinery was installed in the power-house, the locomotive even hauled the trolley car occasionally, one car making the round trip every hour. Now, with three cars and duplicate machinery this is practically unnecessary.

With the death of Mr. Johnson the through line between New York and Philadelphia was allowed to drop, temporarily, because of the heavy holdings of Mr. Johnson and the desire to protect Mrs. Jonnson in her interests without endangering their earnings. Her interests have since passed into other hands. One of Mr. Johnson's ideas, also, was to tunnel under the Hudson River.

About a year ago Mr. Jilson J. Coleman came to Trenton and took control of the Johnson properties and incorporated, with Mr. C. M. Bates, the New Jersey & Pennsylvania Traction Co. Mr. Coleman has just resigned on account of ill health and Mr. Berry is in charge as Superintendent and General Manager.

Besides connecting the Jersey road with those in Pennsylvania, via its bridge, the New Jersey & Pennsylvania Traction Co. will build about 20 miles of road in Trenton and also connect with the Camden & Trenton line. The prospects for carrying out these plans are bright and work has already been begun.

The Yardley, Morrisville & Trenton Street Ry., although entirely in Pennsylvania, is shown on our map as it will extend to New Hope and connect at Lambertville with a road to be built by friendly interests.

The Delaware Valley Traction Co., incorporated early in the year with $100,000 capital stock, by Wilbur F. Sadler, Jr., who built the Trenton, Lawrenceville & Princeton and the Yardley, Morrisville & Trenton, originally planned to build north from Trenton to Pennington and Hopewell, and from Trenton to Lambertville, and from Trenton south to Hamilton Square and Newtown, N. J., in all about 31 miles. But it has just withdrawn the Pennington and Hopewell line in favor of the Trenton Street Ry. Associated with Mr. Sadler are William A. and George Buckman. The latter is President. F. J. Eppelle is the Engineer. Mr. Sadler is about finishing a road on the Pennsylvania shore of the Delaware, known as the Philadelphia, Bristol & Trenton Street Ry., from the city line of Philadelphia, at Torresdale, into the city of Trenton, passing through Bristol and Morrisville. At Morrisville it will run over the tracks of the Yardley, Morrisville & Trenton Street Ry., into the city of Trenton. The road will be 20 miles long and when finished (about Dec. 25, next) will afford direct trolley communication between Jersey City and Philadelphia without crossing the Delaware by ferry. The time will be 1 hour 30 minutes to Tacony and 2 hours 30 minutes into Market street, Philadelphia. The fare will be 30 cents one way. This road will not only have to compete with the steam road, but also with trolley lines on the Jersey side of the river.

There has been much difficulty in getting a road between Trenton and Camden. About four years ago the Camden & Trenton Ry. first put into service about three miles of road between Bordentown and White Horse, and since that time has been adding to its length, until now it is operating 29 miles of rail from Broad and Stanton streets, Trenton, to West Palmyra. Its road ends at Riverton, but from Riverton to Camden it has traffic arrangements with the Camden & Suburban Ry. A part of the latter company's road not yet finished from West Palmyra, a distance of about four miles, is now building and probably will be completed within a few days, thus completing the trolley service from Trenton to Camden. Recently the city authorities of Trenton passed ordinances permitting the Camden & Trenton to extend its lines into the center of the city, and the extension will be rapidly completed. This road, with the C. & S., traverses the entire Delaware River front on the Jersey side, from Camden to Trenton, passing through all the important towns and villages, including the cities of Burlington and Bordentown. With the additions soon to be made, the road will be upwards of 40 miles long. A recent time-table of the C. & T. shows 25 cars run daily from end to end of the line, with many cars that do not make the full run.

The Camden & Suburban besides building to join its two miles of road between Riverton and West Palmyra, now being used by the Camden & Trenton, is also working on its East Moorestown extension and on an extension to Haddon Heights. It is also seeking additional right of way in Camden. It operates 48 miles of track, of which 30 are leased.

A tunnel will be built between Camden and Philadelphia by the Philadelphia & Camden Tunnel Co., and then cars can run into the main business section of the Quaker City from Trenton.

Now turning our attention to the Atlantic coast, we see there are some roads proposed or building that are to connect existing lines and make a trolley road from Jersey City well down the coast and through the summer resorts. There have been for some years some small roads on this route. From Rahway the East Jersey Traction Co. (see above) will also build to Boynton Beach. Those interested in the East Jersey Traction Co. are former Governor F. M. Voorhees, Judge Benjamin A. Vail, of Rahway; Senator H. F. Kean, Julian Kean and Frank Bergen, of Elizabeth. From Boynton Beach, as already stated, the Raritan Traction Co. has a road to Perth Amboy. It has in view, during the coming year, an extension from Perth Amboy, across the new county highway bridge over the Raritan River to South Amboy, a distance of about four miles, to connect with the Jersey Central Traction Co., which is now building an eight-mile extension from South Amboy to Matawan. The Jersey Central Traction is already in operation from Matawan to Keyport, five miles, and in addition to the above extension has let contracts for an extension 17 miles, to Red Bank from Keyport, and to Atlantic Highlands, about nine miles.

From Red Bank there is continuous trolley connection through all the Jersey coast resorts as far down as Belmar. The Monmouth County Electric Co. has a road 8½ miles long from Red Bank through Shrewsbury to Long Branch. Here it joins the Atlantic Coast Electric Railroad, which operates over private right of way, except for the local road in Asbury Park, all the way from Pleasure Bay and Red Bank through Long Branch, Allenhurst and Asbury Park to Belmar. The company operates about 25 miles of track, but is being reorganized by former Senator Jas. Smith, Jr., as Receiver. It has franchises to extend to Sea Girt, about four miles. The Monmouth County Electric Co. will build an extension north from Red Bank to Atlantic Highlands.

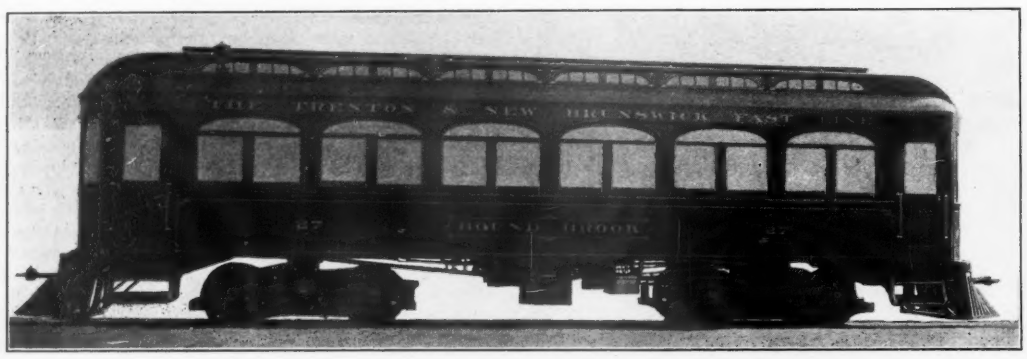
The Point Pleasant Traction Co. operates in the summer four miles at Point Pleasant Beach, formerly the property of the South Jersey Street Railway.

Following down the coast, there are no other trolley roads until Brigantine Beach is reached. Here there is a road of seven miles operated in summer only, connecting with boats running to Atlantic City. The railroad extending from Absecon Inlet to Longport, through Atlantic City, 8.71 miles, is a part of the West Jersey & Seashore R. R. (Pennsylvania R. R.), but is operated by electric power.

At Ocean City there are seven miles of road, and at Cape May there is a road 11 miles long, probably to be extended next year. The Ocean Street Passenger Railway Co. will build a short line at Cape May City.

For some time past there have been reports of a road to be built from Camden across the State to Atlantic City. There are some capitalists working on roads on both sides of the State, but they do not intend to build from Camden to Atlantic City.

One of these companies, the Burlington County Traction, was incorporated last February by Isaac A. Sweigard, of Atlantic City, formerly General Superintendent, Philadelphia & Reading Ry.; Clarence H. Polhemus, Mount Holly, and Charles H. Burr, of Philadelphia, with $225,000 capital stock. It has bought the Mount Holly street railroad and is changing it to a trolley road. With Mount Holly, the county seat of Burlington County, as a center, the company will run out lines in several directions. It has completed all grading from Mount Holly, 10¾ miles, west to Moorestown, and will finish this road just as soon as its rails are delivered. The cars for this section have been delivered. At Moorestown it will connect with the Camden & Suburban, the two companies having agreed to use each others tracks between Mount Holly and Camden, 20 miles. The road will be single track with turnouts and laid with 60 lb. T rail. All bridges are steel, the largest, over Rancocas Creek, is a draw bridge, 183 ft. long.



High Speed Car for the Trenton & New Brunswick Electric Railroad.

From Mount Holly the Burlington County Traction Co. will build east six miles to Pemberton. Another branch will be from Mount Holly to Burlington, six miles, and this will be started soon under the direction of Josiah K. Bougher. The territory through which the Burlington County Traction is building averages about 2,000 people to the mile. Considering this, it may be said that that part of the Pennsylvania Railroad between Burlington and Mt. Holly, over which for some years as an experiment, the passenger traffic was operated by electricity is again operated by steam. The traffic was too light to warrant electrical operation. The People's Traction Co., incorporated July last, with $175,000 capital, unites under one corporate management the many companies which have been organized by I. A. Sweigard and Josiah K. Bougher, of Philadelphia, and others.

In Atlantic City there are several different projects to supply additional service. Three of these are: The Delaware River & Atlantic City R. R., the Atlantic City & Suburban Traction Co., and the People's Traction Co. The latter is building the Burlington County Lines.

The People's Traction Co. has bought the charter granted years ago to the Atlantic City Passenger Railroad and has filed new maps with the Council of Atlantic City and petitioned for franchises. In brief, it will be sufficient to say that the locations are desirable. From Atlantic City it is proposed to build west across the meadows to Pleasantville, and from there north to Absecon, and also south to Somers Point. This in addition to the work around Burlington is about all the People's Traction Co. has in view in New Jersey, but as it is locating roads on both sides of the State, it has given rise to report of a cross-state line.

The Atlantic City & Suburban Traction Co. has recently bought the turnpike from Atlantic City to Pleasantville to build a trolley railroad on it, and also proposes to build to Absecon and Somers Point, the same location as the People's Traction Co. Atlantic City people have, however, taken steps to build a new highway to Pleasantville. The A. C. & S. is capitalized at $500,000, and is said to have issued a similar amount of 30-year 5 per cent. bonds and let contracts for construction and power house equipment to the Phœnix Construction Co. The officers are Edward R. Sponsler, Harrisburg, President; A. M. Jordan, Atlantic City, Vice-President; E. H. Chandler, Atlantic City, Secretary; C. T. Leland, Philadelphia, Treasurer; H. C. Johnson, Manager, Superintendent and Purchasing Agent; F. D. Haine, Engineer. This company has made no announcement that it will build any further than Pleasantville.

The Delaware River & Atlantic City Railroad, the only company that seems to have seriously planned to compete for Atlantic City traffic with electric power, is reported to have bought land in Atlantic City for a power house and car barns. Its road will be from Gloucester across the State through Hammonton to Atlantic City, and its surveys for a third-rail line are said to have been finally decided upon. It will establish a ferry from lower Philadelphia to Gloucester.

Without going into details it does not seem probable that any electric railroad from Philadelphia to Atlantic City would pay, nor would another steam railroad between the two cities pay, for the reason that the success of the two existing lines between Philadelphia and Atlantic City is due to the fact that each of them has a large railroad system behind it. The fastest passenger trains in the world are run on these roads, and there is hard competition.

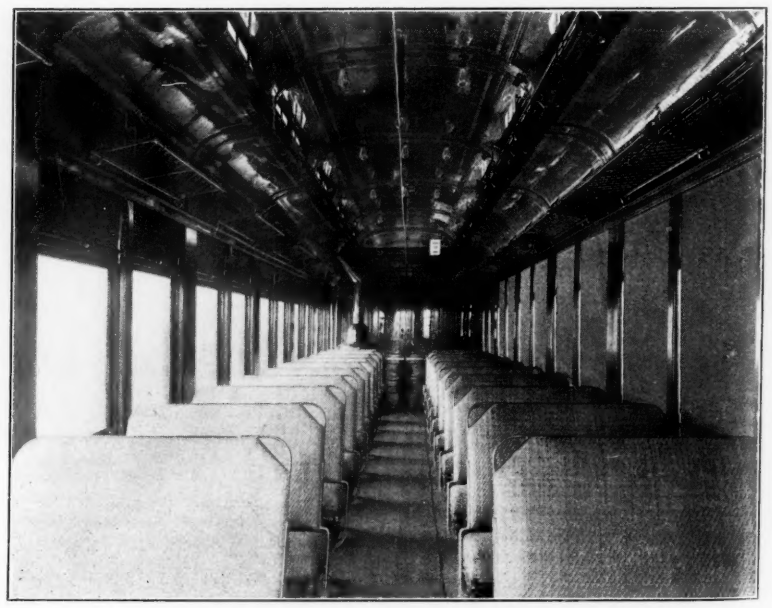
The Atlantic City Street Ry. had permission to build its road in the streets of Atlantic City, but the ordinance was declared by the courts to be invalid, so no work has been done. Among those interested are L. C. Albertson, J. J. Gardner, J. Thompson and C. L. Cole.

The Atlantic City & Chelsea Passenger Ry. is a recent organization to build a trolley road at Atlantic City. John M. Harding is Secretary. The Chelsea Heights Traction Co. is another project for this locality, and has $25,000 capital stock paid up. Kennedy Crossman is President. Of the other projected lines on the south Atlantic coast, the Five Mile Beach Electric Ry. will operate on that beach in Cape May County. Henry D. Moore, of Haddonfield, is interested.

Returning to the roads in the western part of the State and south of Camden, we find that the South Jersey Gas, Electric & Traction Co. of Camden owns the principal road—the Camden, Gloucester & Woodbury, 23 miles long. The capital stock of this road has been cancelled but the name is maintained. The road operates between Mullica Hill and Woodbury and thence to Camden, where connection is made with the Camden & Suburban Ry. A great deal of the traffic is passengers carried to Washington Park on the Delaware River, and National Park, situated some four miles south of Camden. There is talk of extending south, with a branch from the main line at Mantua through Barnsboro and Glassboro to Clayton, about 11 miles.

The Paulsboro Traction Company will build in Gloucester County, particularly between Paulsboro and Woodbury, about five miles. Benj. G. Paul, of Paulsboro, is an incorporator; H. S. Talman, Treasurer.

The Bridgeton & Millville Traction Co., owned by the American Railways Company, runs from Brighton east to Millville, 10 miles, where it connects with the Millville Traction Co., which runs 12 miles north to Vineland. From Brighton the B. & M. runs south to Cedarville, thence to Port Norris, 18 miles from Brighton. The local road in Brighton makes the total mileage 36, and the road the longest in southern Jersey.



Interior of Car "Bound Brook"—Trenton & New Brunswick Railroad.

In the northwestern part of New Jersey there are as yet no trolley roads, as will be seen from the map, but there are some plans to build. We will only mention those which are most promising.

The Easton & Washington Traction Co. was incorporated in May by the Hay Brothers, of Easton, Pa., with $100,000 preliminary capital, and Robert M. Petty, of Washington, is President; William O. Hay, of Easton, Pa., Secretary; R. M. Ellenberger, of Washington, Treasurer. It is to build from Phillipsburg (opposite Easton, Pa.), paralleling the Delaware, Lackawanna & Western Railroad through Washington to Hackettstown, a distance of 25 miles, and then to Stanhope and Lake Hopatcong. Branches will run from Washington north to Bel-

videre, and from Washington south to Hampton Junction, High Bridge and Clinton, making a total mileage of about 50. Franchises and considerable right of way are secured and construction is promised to be begun soon.

The Phillipsburg & Washington Railroad, controlled by the Johnson Syndicate (of Allentown, Pa.,) is trying to lease that part of the Lackawanna Railroad between Phillipsburg and Washington, 14 miles, to equip it electrically and operate in opposition to the proposed Easton & Washington road. This company promised Washington Borough a 10-cent fare to any part of Phillipsburg or Easton (by means of transfers to the Lehigh Valley Traction lines).

The Phillipsburg Horse Car Railroad, five miles long, is leased by the Johnson Syndicate, who also contemplate using it, with the P. & W., for a trolley road from Easton to New York.

The Easton & Bloomsbury Railroad is to build an electric railroad around the cement works at Alpha, Vulcanite and vicinity, and continuing to Bloomsbury, about nine miles.

As yet there are no electric railroads in Morris County, although the locality is considered favorable. There are numerous plans to build and quite a number of surveys have been made. H. C. Raynolds, of Whippany, an early promoter in Morris County, is the only person who has had actual surveys made for roads on private right of way. His project of to-day is a high speed line from Whippany across the county to Lake Hopatcong. This project is not shown on our map, but from all indications there is more in this plan than can be ascertained.

John E. Melick, a civil engineer of Morristown, tells us that he has been at work on a project for a number of years to build an electric railroad, to be known as the New York & Philadelphia Electric Ry., from the end of the North Jersey Company's line at Caldwell, southwest through Morristown, Somerville and Flemington to Doylestown, Pa., from which place there is already a road in operation to Philadelphia. Mr. Melick says that his project will only require the building of about 71 miles of road, and that the capital for building this line is about arranged for. It is understood that some capitalists of Worcester, Mass., are interested in this project. A branch, four miles long, will be built from Caldwell to Little Falls to connect with the road into Paterson.

C. F. Kindred, of Philadelphia, Pa., is making final arrangements to build a local road in the vicinity of Dover.

The only project that has got so far as to be incorporated is the Morris County Traction Co., of which Robert D. Foote, of Morristown, is President. The company was incorporated several years ago, and has a capital stock of $30,000, all of which is paid in, and it has quite a system planned over the highways in Morris County. The headquarters are in Morristown and the road will begin at Chatham and parallel the Lackawanna Railroad for its entire proposed length, passing through the towns of Madison, Morristown, Boonton, Rockaway and Dover to a place called Landing at the south end of Lake Hopatcong, and just east of the town of Stanhope, which will be the eastern end of the proposed Easton & Washington Traction Co.

The Whippany River (Steam) R. R., which recently incorporated a new company to build an extension to Essex Fells near Caldwell, it is said may some day change its steam road to a trolley.

In Essex County the Essex Cross Railway, of which Francis M. Eppley, of South Orange, is President, will build from the Pennsylvania Railroad station, in Elizabeth, through the latter city, Irvington, East Orange and Watsessing, terminating in Bloomfield, at the station of the Lackawanna Railroad. It already has a number of franchises.

The Watchung Scenic Electric Ry. is being organized by people in Plainfield to build an electric railroad along the Watchung Mountains from North Plainfield to Chimney Rock, five miles. Connection will be made with the Plainfield Street Railway, also with the Middlesex & Somerset Traction Co.

The Hoboken Railroad, Warehouse & S. S. Co., known as the Hoboken Shore Road, has four miles of road connecting steamship piers and railroads in Hoboken. Electric motors are used to haul trains of freight cars.

The Hudson River Traction Co. is a recent incorporation by officers of the New Jersey & Hudson River Railway & Ferry Co. It has $1,500,000 authorized capital, and its broad privileges include tunnel work and railroads on the surface of the ground and beneath it, and absorbtion of some existing companies. Beyond this, nothing is determined.

In connection with the numerous projects for tunnels under the Hudson from New York City, there are also projects for terminal roads on the Jersey side which are intended to act as feeders from all the steam railroad and electric railroad stations to the tunnels which will be operated by electricity.

Efficient Discipline.*

BY C. H. KETCHAM, *Superintendent of the Delaware, Lackawanna & Western at Hoboken, N. J.*

When speaking of discipline, it is generally thought by the men as meaning suspension from service; but the Century Dictionary says it means teaching, instruction, cultivation of the mind, government and special training to act in accordance with rules. We understand the meaning of discipline to be the means of securing the best results we are now desirous of accomplishing. First, a staff of officers is necessary, men who are thoroughly conversant with their duties, who have complete control of themselves—having been well disciplined. A man who cannot control himself in the handling of men should not have control of others, because he will do himself injustice and certainly do injustice to the men under his charge. Here can the foundation be laid for future success in disciplinary effort.

The work of the Train Rules Committee of the American Railway Association has made the establishment of rules governing employees in train service easier than formerly, and as most roads have adopted standard rules, it has improved the work and education of trainmen. The local conditions, however, of each road must be carefully considered, taking into consideration the facilities; special rules can take care of such matters. We will then treat the question on a road organized and operating under standard rules, assuming that when they employed a trainman they anticipated he would some day be their passenger conductor or an officer, or the fireman would some day be a passenger engineman, and that the requirements of men in train service at the time when these men should reach such advanced positions, would call for higher ideals because of the more exacting demands of the public and denser traffic conditions. If these men are started out understanding that Progress is the watchword, a good beginning has been made.

The conductor should be held responsible for all employees on his train; he should see that they obey the rules and render efficient service. If this is done by each conductor, the efficiency of all trainmen will show; the weak man will be discovered, the man who has the qualities requisite for good service will be brought out, and the necessity for applying discipline will therefore decrease. The employee who does not do his duty in this manner and fails to report violations of the rules that may lead to destruction of property or interruption of traffic, is really helping to create the necessity for applying discipline, is not giving loyal service and not doing himself justice.

The best discipline would discover irregularities and correct violations of rules or lack of good judgment before loss of life or destruction of property occurs, making it necessary to inflict punishment. Close watch should be kept, and when it is found that the conductor, engineman or other trainmen are violating rules that may lead to trouble, get as many together as possible, tell them what these violations are and what they will lead to, and inform them that you are doing this because you want to keep them out of trouble and obtain good service. A case in question on a certain railroad occurs to me. Speed was restricted on dead freights down a certain grade, but the slow speed order had been long neglected; a train of twenty-five cars became derailed because they were not able to stop where a rail was up, although flagged a mile distant, and four new engines were wrecked at the foot of the grade. The Superintendent changed shortly after; the incoming Superintendent heard of the wrecks, had his Master Mechanic get together as many enginemen as possible at one time, told them all about it, informed them that the speed limit was going to be enforced on second-class trains, and that it was necessary for all to run their trains to make the same time. This case was used as a text for special instruction. Ten years have now elapsed, and there has not been a wreck there since.

Trainmen should understand that short time ahead of passenger trains will not be allowed, that these trains must have clear block, and that it is unsafe, giving them in detail the reasons why; tell them that if their train should get into trouble they must take time to protect the train if it should take a week, and not violate other rules in their desire to get the train clear of the main track, which might result more seriously. Train despatchers are liable to get men into trouble urging them to get over the road. Conductors should feel that they will be upheld in not taking chances, regardless of the class of their trains. But what has this to do with discipline? It is teaching them, and having them realize that you are desirous of keeping them out of trouble.

When promoting a trainman to conductor, or fireman to engineman, after they have been examined by Master Mechanic and Train Master on machinery and train rules, good results, I think, are obtained by the Superintendent taking them in hand and bringing to their attention their increased responsibilities, what is expected of them, and cautioning them not to take any chances, but if in doubt to put their train on a siding, stay there, and ask the despatcher for advice, that it will not be considered a reflection but a desire to be right; tell them of irregularities that have occurred, how they occurred and how they could have been prevented. Impress upon them the responsibility of themselves and the company to the public and let them know that if they obey rules and show good judgment the Superintendent will not be compelled to administer discipline—that they make the cases and, like a judge in court, he has to do his duty as an officer of the company.

Officers in charge should be watchful of the length of time the men are on the road, should not permit despatchers to exact work of way-freight and pick-up crews that is unnecessary and should know that sufficient trains of this character are run to enable the men to get over the road in reasonable time. Through crews should not be required to do switching in yards or on the road, where switch engines should be supplied. If an engine is not doing well, then cut the train down to what can be handled and keep all trains moving, so the men will not get worn out. When short of power, do not let the enginehouse foreman put an engine in service unless it is fit. Do not wear your men out by giving such an engine. Insist on your trainmen having rest, though you may be short of crews and blocked with freight. When you do not do this, you place them where they become worn out and cannot do their work properly. You may indirectly be the cause of a wreck and lose much more by traffic being blocked than you gain by using two or three unfit engines, and, as well, have helped to demoralize the men. Is this good discipline? Watchfulness and vigilance are required by an operating officer in ways too numerous to mention, but enough has been outlined to suggest what we can do to teach.

The officer who has to inflict or decide punishment for violations of rules should be fair, honest and conscientious, appreciating that he represents the company, the public and the men. If he knows of an employee whose record is such that the man should not be kept in the service, but does not dispense with his services, he has indirectly and to a certain extent assumed responsibility for the man's acts. The Court would not excuse, neither would the public who look to the officers to protect them from disaster. That punishment is necessary for violation of rules cannot be denied. If we violate the laws of the State, we have to stand the punishment inflicted; if we violate the laws of health, our body suffers—in both cases to the extent of our violations. All men are not of the same temperament, therefore they cannot all be handled alike. Some men feel keenly a reprimand or a record placed against them, and with them such punishment has good results; whereas other men must feel the rod, and suspension of certain duration seems to be the only punishment that will get the best results out of them. Employees should know that they are going to get the benefit of their record, and, if suspended for two weeks for a certain offense, know that another man getting into the same trouble but without their good record would be suspended thirty days; they should realize the reason why this is so. Where several wrecks of the same nature have occurred the temptation to discharge the third man regardless of record, because the officer thinks it must be stopped, does not look like justice. The third man involved should be handled for his act on its merits. Thorough investigation should be conducted and all possible efforts made to obtain the facts; if in doubt, take the necessary time to make sure that you are satisfied who is at fault. Try and make plain to the person responsible where he violated the rule or lacked in good judgment; but after you have concluded that the employee should not be kept in the service, he should never be re-employed. To discharge a man is a very serious matter; therefore the conclusions should be drawn only after very careful consideration. If a man is good enough to re-employ he should not have been discharged. The custom of discharging a man while expecting to re-employ him destroys effective discipline; the Superintendent's approval should be required before discharging an employee. The enforcement of rules should be very exacting, especially where the train movement is affected.

As to what punishment is the most effective, a record or a reprimand in some cases is sufficient; at other times a moderate or long suspension is necessary. Each case must be considered on its merits; no set plan can be laid down that can be followed with invariably good results. The "Brown" system has been juggled to such an extent, to meet the wishes of an officer who has a desire to be slack on discipline or who lacks the courage to enforce it, that it has lost its effectiveness; whereas, had that officer tried to build up the man he would not have an unpleasant duty to perform. Our judges would not be long tolerated if they failed to do their duty, so an officer should do his duty without fear or favor, but tempered with mercy and justice. From information received in conversation with the rank and file on some of the roads, I am led to believe that many Superintendents courted the Brown system because formerly their ranking officers frequently reversed their decisions and destroyed their usefulness as disciplinarians. Now the Brown system saves them from embarrassment. The Superintendent should be the officer to whom the men look to settle their cases; if he knows them as he should and is the right man in the right place, the company as well as the men will be fully protected.

EXTRACTS FROM PAPER BY W. W. WHEATLY.

"Order is Heaven's first law." Permanence and stability depend upon law and order. The proper management of large enterprises, such as armies and railroad systems, requires the united action of a large number of individuals. It is essential that the individual units work with one common purpose and that individual energies be concentrated.

The instruction and training of employees, especially those engaged in the train, station or car service, has not been given the attention its importance demands. After a long and varied experience in steam and electric railroad operation the writer has become greatly impressed with the lack of systematic methods of instruction and training. New and untried men come into the service as apprentices and graduate into responsible posi-

*Papers read at the meeting of the New York Railroad Club held on Nov. 21.

tions under the guidance of some older man. The instructor may not himself have been properly instructed or trained, or if properly trained he may not have the faculty of teaching others. Later, these new men undertake to instruct others. The new man, without any special attention upon the part of anyone, becomes part of the great machine. Proper training depends not alone upon a thorough acquaintance with the rules and regulations and the general or specific requirements of the service, although this is a primary requisite; it depends largely upon a methodical and systematic course of inspection to determine whether there is proper observance of the rules and an honest pride in the service. To know the rules is one thing, to habitually observe them is another. Good judgment and discretion must begin where the rules end, and these things can only be installed into the apprentice by continual inspection of his work and the correction of his faults. The admirable discipline in the army and navy comes from constant and persistent training and inspection. The instruction is given by men selected and educated for the purpose and frequent inspection is made by the higher officers. Some of the electric railroads have established schools of instruction and nearly all of them have more or less effective methods of inspection. The schools of instruction are equipped with skeleton cars exposing to view the operations of motors, controllers, trucks, brakes and showing clearly the wiring and all the mechanical and electrical details of the cars. Competent instructors give lectures periodically and there are occasional talks before large numbers of the men by one or more officers of the company. The steam railroads have maintained for many years air-brake instruction schools, but their efforts as a rule have gone no further.

To enforce rules there must be a recognized authority with power to fix penalties. It is better to prevent disobedience by careful training and systematic inspection than it is to punish the offender. That is generally the best government which is supported and upheld by the governed, and which accomplishes the end of its organization with the least friction and the least display of arbitrary authority. It requires the rarest kind of executive ability to administer punishment for wrongdoing in a manner that will be considered by all men as fair, just, righteous and honorable. The old method of punishment by means of suspensions and fines appears to be giving way to a more enlightened and merciful method which not only answers the same purpose but has a greater educational value. Every occurrence for which punishment may be administered ought to be turned to the benefit of the transgressor and be so handled that he may look upon it as an object lesson and a stimulus to better things. Many of the large roads of the country have within recent years adopted one or another modification of the system known as the "Brown" or "Fall Brook" system of discipline without suspension, and have reported its good results. It is evident that the best-managed railroads of the country are committed to the principle. The writer believes thoroughly in the underlying principle and thinks that all roads should adopt some modification of the essential idea. Its adoption will not, however, alone bring successful results; something more is required than to inaugurate the principle. To secure the best results the men must become willing and earnest workers and be induced to take pride in their vocation. The manager of every large institution should not meet his men only when trouble arises; he should meet them at regular intervals, touch elbows with them, talk with them about their routine work and show them by his actions that he has an interest in them and a genuine regard for their welfare. By such means, doubt and distrust are overcome and a more perfect confidence is encouraged.

EXTRACTS FROM PAPER BY G. W. SLINGERLAND OF THE AMERICAN EXPRESS CO.

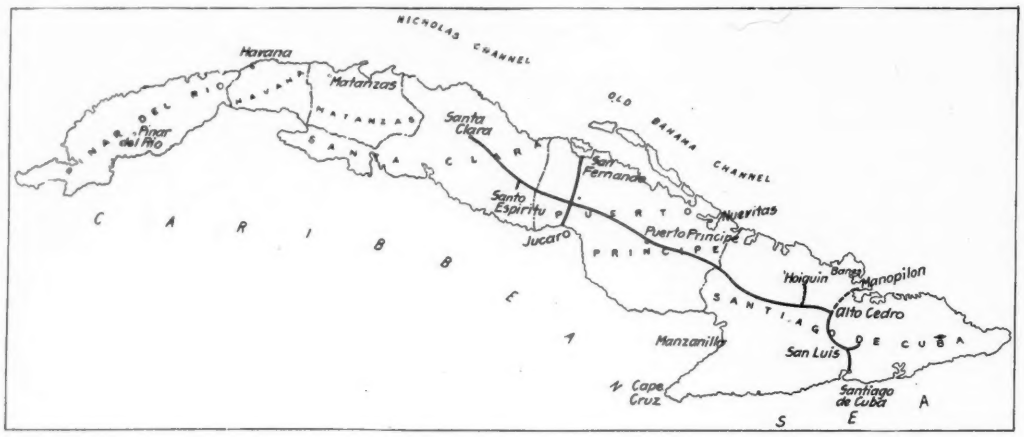
"Discipline is the training and education of men in all the duties of their profession, and the implanting of that respect for authority which causes them to obey without question the legal orders of their superiors under all circumstances; it cannot be obtained without organization and thorough and continued instruction; it is the essential factor in preserving the zeal, spirit and confidence of any force." Herbert Spencer says, "A stern discipline pervades all nature, which is a little cruel, that it may be kind;" and as both mental and physical characteristics are hereditary, we see the descendants of those nations most severely disciplined, even centuries ago, among the "survivors of the fittest" to-day. It was the severe physical discipline of the Legions of Rome which made them the conquerors of the world.

It is a popular belief that the discipline of the Post Office Department is the embodiment of all that is perfect; but it is my individual opinion that other more important factors have aided in the development and perfecting of our magnificent postal service. Prominent among these factors we may mention the extraordinary facilities provided by railroad and steamship companies, frequently at nominal cost—our sublime and childlike faith that Government can do no wrong, which causes us to pay both for transportation of our mail matter and taxes for transportation of other people's freight by mail—and the much decried "spoils system" which, making political bosses of its fourth-class postmasters and officials of higher grade, for a long period gave to the Government, without adequate pecuniary compensation, invaluable services sometimes of the very highest administrative ability which, if paid for in cash, would either have swelled the appropriations to an unwarrantable extent or reduced the value of the service by its withdrawal from cross-road hamlets.

The American Express Company has a small army of men working in and traversing 30 States and territories and all the Canadian provinces, and of agents and shipping correspondents in every commercial port and city of the Old World. The first of its General Instructions is: "A printed circular is issued from the President's office monthly for the information and instruction of employees only, etc." The heading of this monthly circular reads, "Suggestions tending to simplify details, further economy or increase the efficiency of our system for doing business are cordially invited from all connected with the company, and will be duly considered." These circulars are always educational and are eagerly looked for and carefully studied by employees who are trying to fit themselves for promotion, and that covers the majority of them. Another of the General Instructions says, "*The most polite and gentlemanly treatment of all customers*—whether men, women or children, rich or poor, white or black, or however insignificant their business—is insisted upon. It is very politely intimated to the employee that if the company does not get patronage on account of his incivility it will have no use for him, and there is no question that it is so read and applied.

The lowest grades of service are label-boys, porters and wagon helpers. Promotion for efficiency is the invariable rule, and as its officials of every grade have been promoted from its ranks the ambitious young men in all grades are always trying to fit themselves for promotion. . . . It does not claim its discipline or methods are perfect; but what discipline is perfect? The dead letter office at Washington has received during the year over nine million letters and parcels the owners of which were "not found," and in those so far opened have been found money and valuables of the face value of over one million four hundred thousand dollars.

The express company's men from the lower grades of service become so extremely proficient in the geography of the country that there is always a considerable portion of its depot force [at New York] competent not only to sort, waybill and load quickly but to name the proper route, trunk or identical place in the car where each shipment should be placed to insure its reaching destination by the shortest and quickest route, even if such destination should be, as is frequently the case, a small hamlet off of railroad lines.



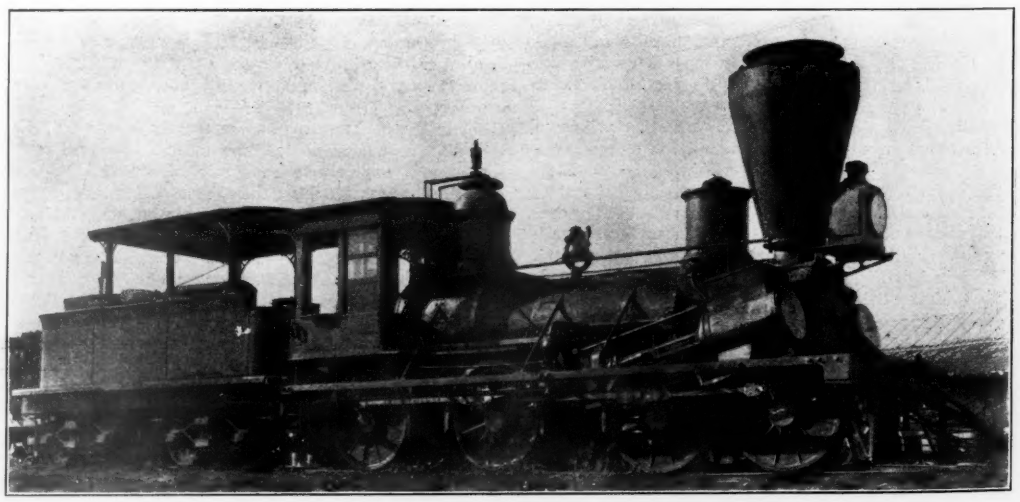
The New Railroad in Cuba.

Office of the Cuba Company—Plaza at Puerto Principe.

The New Railroad System in Cuba.

The present month marks the completion of the Cuba Company's new road, affording a trunk line route from Santiago, on the east, to Santa Clara, in the center of the island, with a through connection to Havana. No other railroad building has been done in Cuba since the Spanish war, and there was very little done for some time previous to it. But the new enterprise is less noteworthy on this account than for boldly striking into a territory entirely undeveloped, from one end of the line to the other, so that it must create its own traffic, and grow up with the country.

The accompanying map, outlining the route of the new system alone, shows what has been accomplished. At the time of the war, there was a fairly complete system of railroads in the west, terminating abruptly at Caibarien, on the north coast, Santa Clara, in the center, and Cienfuegos on the south. It will be seen that a perpendicular from Caibarien would include all of these lines, and yet fall considerably short of bounding the west half of the island. The system, as it then existed, was the outgrowth of a series of short cuts from sugar plantations to the coast, many of which

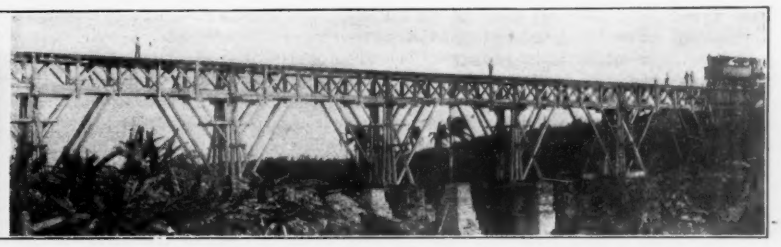


Baldwin Engine 30 Years Old, Savanilla & Maroto Road.

were built a long time ago, but were more recently connected and consolidated, by English capital.

Three companies practically controlled the traffic. The United Railroads of Havana served the Havana province, the Cuba Central Co. operated in the adjacent province of Santa Clara, and there was a third company which worked the diagonal Cardeñas-Jucaro system. Beyond Caibarien, there were four transverse roads, two of which were of considerable importance, and several

A Characteristic Stretch of Line Near San Luis.



A Viaduct 30 Years Old.

insignificant spur lines, but no attempt had ever been made to do more than reach the most convenient harbor, and except for roundabout wagon roads, in bad condition, there was literally no means of overland communication between Havana and Santiago.

The most interesting of the transverse railroads east of Santa Clara was the one which crosses the island from San Fernando to Jucaro, and was built by the Spanish government solely for military purposes, with a block house at each kilometer, and the historic clearings fenced with barbed wire, in between. This road is 57 miles long, and the Cuba Co. leased it from the provisional government, after the war, in order to obtain connection with the harbor of Jucaro.

The old Puerto Principe-Nuevitas railroad, which is 46 miles long, and was built considerably before 1850, is also of interest, among the transverse lines. As it stands, in view of the very slight changes it has undergone since it was built, it may fairly be called one of the oldest railroads in the world. It was a private concern, built without stock or bond issues and had no debt. At the end of every month, after the payment of bills, all the remaining cash on hand was piled on a table and raked out into eight shares. Each shareholder then received his allotment and the books were closed. It was in the best physical condition of any road in Cuba at the time of the war, and earned about 15 per cent. on the capital invested.

There was also a line in existence from Gibara, which is on the north coast, well along towards the eastern end of the island, to Holguin, 20 miles south. This road is distinguished as possessing a tunnel 150 ft. long; the only tunnel on the island of Cuba, and supplied the city of Holguin by means of trains which ran two or three times a week. In fact there are very few of the small roads in Cuba which maintain a daily train service.

East of Puerto Principe there was also a very old road known as the Savanilla & Maroto, which did not even approximate reaching the points named in its title, but ran from Santiago de Cuba to San Luis. It has in its possession some curious old Baldwin engines, with inclined cylinders, built probably 50 years ago, and doing the best service to-day of any on the road. The entire 30 miles owned by this company was also bought by the Cuba Company, which thus obtained access to Santiago de Cuba, and the only readily accessible route through the Sierra Maestra mountains. The latter run from Cape Cruz entirely across the southeastern promontory of Cuba, and constitute a serious barrier.

territory in the best possible way, with a trunk line along the central backbone of the island, commencing at Santa Clara. There were four ports available for supplies, Sagua, reached by the Munson Line, which was the chief carrier of hay and grain, and Jucaro, Cienfuegos and Santiago, reached by the Ward Line, which brought rails, etc. Thus provided, the hauling of materials was accomplished without serious difficulty.

The engineering work was also relatively simple, with the exception of about 40 miles, less than a tenth of the entire system. The work was heavy for about 20 miles at the Santa Clara end as far as Placetas, and also between San Luis and Alto Cedro, on the east, but the majority of the line runs through a flat country which contains long stretches of prairie, with a number of places where there is practically a tangent for 20 or 30 miles. There was one important crossing of the Guaninicum River, which is a branch of the Cauto, the

Cut West of Guaninicum Bridge.

largest river in Cuba. This also is at the eastern end of the line and is crossed by means of two 150-ft. pin-connected spans, two 80-ft. spans and approximately 300 ft. of trestle. There is a deck bridge 30 ft. above high water. In several parts of the route, the canyons, which run from 60 to 100 ft. deep, occasioned difficult work, as it was necessary to allow from 30 to 40 ft. for the difference between high water at the time of the floods, and low water.

The line at present contains a number of temporary wood trestles which are to be filled in gradually, but all the permanent work is of heavy character. The timber known as caguaran, which is found in great abundance, is peculiarly well adapted to railroad building, as it seems to be almost indestructible and stands for 30 years, and often much longer, without rotting. This has been used for small culverts along the line, although the prevailing type for larger work is of limestone masonry. Excellent gravel for ballasting purposes is found in various places, and also disintegrated limestone, which makes a very compact roadbed. The new part of the road is now laid with 60-lb. rails, which will be left down until the line has settled into shape, after a year or so, and then replaced with 80-lb. rails, the lighter steel being used on branch lines, of which there are a number in prospect.

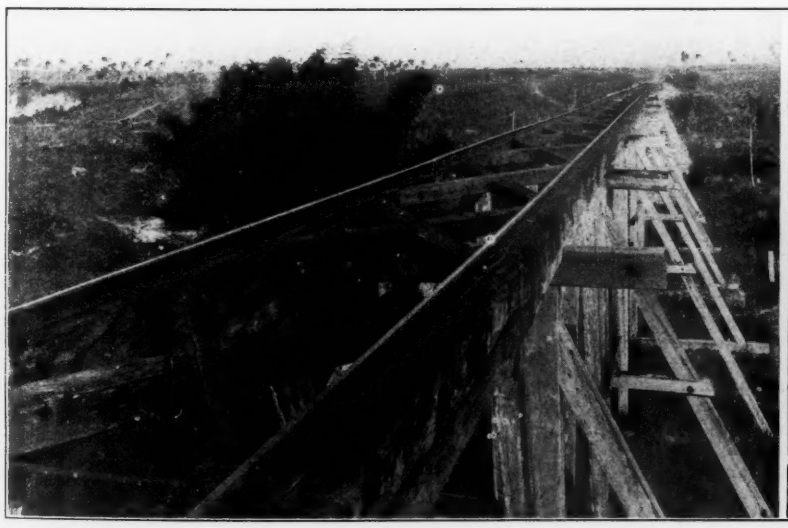
The maximum grade on the entire system is 1 per cent., and the slopes are all short and undulating, the profiles being made with view to a line which will ultimately have no ascent greater than 0.5 per cent. There is only one place on the system, a 10-mile rise out of Santa Clara, where this is not feasible. The heavy work near Santiago is all on a grade which averages 0.3 per cent., and the rises are so short that they can practically be worked as a level line. The minimum radius of curvature is 6 deg., and, as previously stated, the majority of the line is very straight indeed, except for the two ends.

This sums up the line as it exists to-day, the main portion from Santa Clara to Santiago de Cuba, which is now ready for opening, being 354 miles long, with branches which aggregate 120 miles additional, making a total of 474 miles.

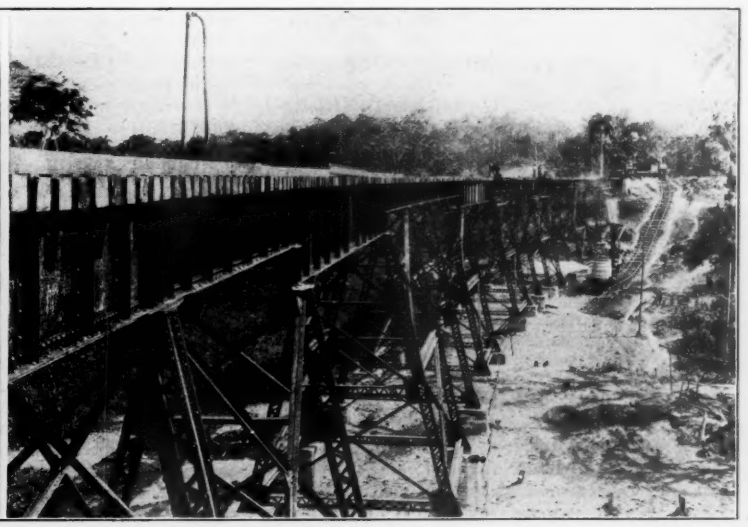
The company intends to encourage immigration along the line and to establish sugar factories as fast as they can be supplied by settlers. At present there will be practically no steady traffic except from tourists, but the great improvement in transportation possibilities which the line affords, will doubtless build up a very heavy tourist traffic in the winter months, similar to that now existing on the east coast of Florida. To stimulate this kind of trade, the equipment is thoroughly modern and luxurious.

The map shows a broken line from Alto Cedro, the turning point for Santiago de Cuba to Manopilon, on the Bay of Nipe. This stretch, 30 miles long, is included in the system and will probably be completed this winter, with the idea of developing the wonderful Bay of Nipe, a harbor 30 miles long and perfectly protected, with a wide entrance 200 to 300 ft. deep, and with only one turn. Between the Bay of Nipe and Banes on the north, there is practically an inland waterway, only obstructed by stretches of a few hundred feet of marshy land, and a future project is the clearing of a channel between these points so that the important fruit traffic which now centers about the unsatisfactory harbor of Banes as its export point, may be diverted to Nipe Bay. The country is exceedingly productive all along the route, and as it is almost wholly undeveloped at the present time, the new railroad has evidently a commercial position of great strength, and should participate largely in a future increase in Cuban prosperity.

A run was lately made on the North Eastern with one of the new mineral engines, working from the collecting station to the Tyne Dock; the load was 68 wagons and the weight of coal was 720 long tons; the total weight of the train, including the van, was 1,140 tons. The engine used was one of the new eight-coupled goods, with a boiler and fire-box similar to that in use on the large 10-wheel passenger engines which have been illustrated in the *Railroad Gazette*. The shipping facilities at the docks are quite up to the most modern American practice and gravity is largely used.



Naranjo Viaduct, Near San Luis, 30 Years Old.



Hatico Viaduct, Province of Santiago.

Mention may also be made of a line 15 or 20 miles long, through a rich sugar district in the little valley tributary to Guantanamo Bay. Except for a few spur lines, previously mentioned, this completes the list of railroads in Cuba before the war, and a glance at the map shows that the largest and richest part of the island was entirely devoid of transportation facilities.

The aim of the Cuba Company was to serve the vacant

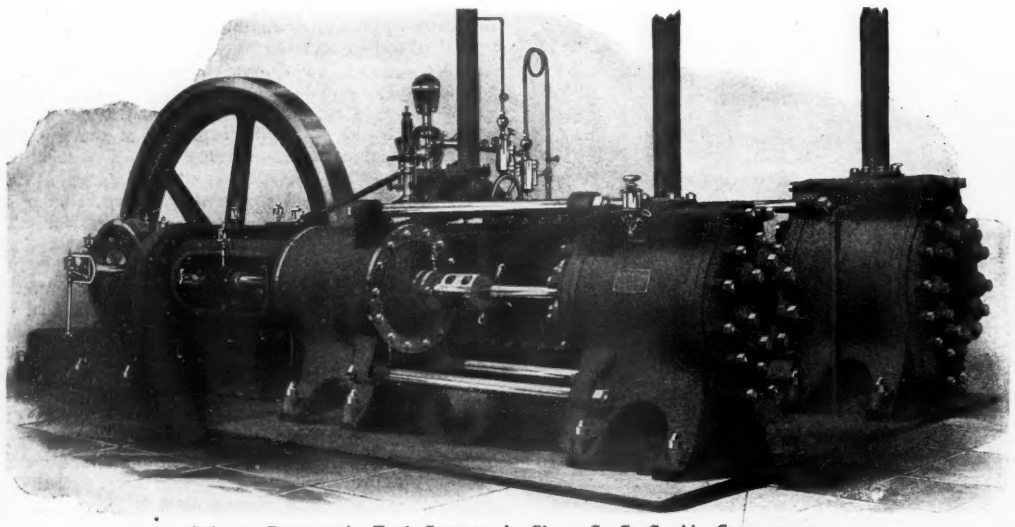
A New Air Compressor.

The Chicago Pneumatic Tool Company is building a new type of air compressor at its Franklin, Pa., works which was designed to give high efficiency. The one shown in the illustration is called the Class C.S.C. and has compound steam cylinders, 31 and 20 x 24 in., and two-stage air cylinders 28 and 16½ x 24 in. The delivery pressure is 100 lbs. with steam pressure ranging from 100 to 150 lbs., the capacity being 1,710 cu. ft. of free air per minute at 100 r.p.m. and 2,052 cu. ft. at 120 r.p.m.

The frames follow the best approved Corliss construction and are designed for great strength. The steam and air cylinders are placed tandem and are connected with heavy tie rods, the whole being supported on a heavy sole plate. The cylinder material is extra close-grained iron. Steam and air pistons are of the solid type, cored hollow to avoid unnecessary weight, and are provided with snap rings of special iron carefully fitted to place. They have no followers or bolts. Stuffing boxes are of ample depth and piston rods are of steel, turned true and polished.

The air cylinders and cylinder heads are well water jacketed. Provision is made for a circulation of cold water the entire length of the cylinder, the water passing also through the heads, its cooling effect being especially concentrated around the discharge valves, which receive the effect of the heat due to compression and friction that has not been absorbed by the water jacket during the actual process of compression. A novel feature is an outside water connection for conducting the circulation of water between air cylinder and cylinder head, excluding the possibility of serious accident through water entering the interior of cylinder should the gasket between cylinder and head become ineffective.

The bearings are large and well proportioned. The main bearings are provided with removable shell boxes



Chicago Pneumatic Tool Company's Class C. S. C. Air Compressor.

and only the best phosphor bronze and genuine babbitt metal are used. All bearings are adjustable for wear, with ample provision for oiling. Steam valves are balanced slide valves, adjusted to give the best economy in the consumption of steam, and are provided with Meyer independent adjustable cut-off. All valves have provision for readjustment when required by wear.

The air inlet and discharge valves are of the poppet type, placed in the cylinder heads from the outside and easily accessible for adjustment or repair without removing the cylinder heads. The valve, valve-stem and head are forged in one piece, to avoid the use of flange nuts, jam nuts or split pins. A feature of this valve is the use of a valve-seat separate from the cylinder proper which may be removed, replaced or renewed whenever occasion requires. The valve and seat form a complete piece of mechanism which may be examined, reground and adjusted separate from the compressor.

The valve seats are of bronze and the springs of steel, light enough to minimize resistance in opening, yet strong enough to seat the valve promptly in closing. The proportion of valve area to cylinder area is made liberal to enable the cylinder to fill freely at each stroke and avoid volumetric loss or impaired efficiency due to any wire-drawing effect of insufficient valve area. The cylinder flanges are recessed to prevent the valves from falling into the cylinders, avoiding the necessity of a guard plate.

The cranks are of disc pattern, made from best quality of charcoal iron. Shafts and crank pins are force fits, the former being keyed and the latter riveted, especial care being taken to have the shaft and pins parallel. Crank pins are of special steel, ground; crank shafts are of unusual strength, made from best hammered machinery steel, accurately turned and finished. Connecting rods are made from best forged steel, carefully finished. Boxes are adjustable for wear, and accord with the best approved practice for compressors. The guides are bored, and crossheads are provided with babbitted shoes at the top and bottom with wedge adjustment for taking up wear.

A combined speed and pressure regulating governor is provided to regulate the steam supply to the compressor to suit the air consumption, maintaining a constant air pressure, and regulate the speed of the engine. The intercooler has convenient provision for cleaning the interior and the tubes are made of a composition metal to prevent rusting.

Suitable provision is made for automatic oiling, sight-feed lubricators of ample capacity being furnished for steam and air cylinders, centrifugal oilers for crank-pin bearings, and oil cups of approved pattern for all wearing parts. The steam and air cylinders have connections for indicators.

This type of compressor is built in three sizes ranging in capacity from 500 to 2,000 cu. ft. of free air per minute, and is also built with simple steam cylinders. A great many of these compressors are in operation at the shops of many of the largest railroads, in United States navy yards and in important manufacturing plants.

The Society of Naval Architects & Marine Engineers.

The tenth general meeting of this society was held in New York city Thursday and Friday of last week, ending with a dinner Friday evening.

The election of officers made but few changes. The President, Mr. C. A. Griscom, and most of the Vice-Presidents and Members of Council, were re-elected. Amongst the Members of Council, Lieut. Albert P. Niblack took the place of Mr. Edward Farmer, and Mr. H. G. Morse that of Mr. George E. Weed. In the Vice-Presidents, Mr. Stevenson Taylor was elected to fill the unexpired term of Rear-Admiral Sampson.

The first paper on the list was

TECHNICAL TRAINING FOR SHIPBUILDERS,
By Henry S. Pritchett, LL.D., President of the Massachusetts Institute of Technology.

A few extracts from this paper follow:

A modern steamship, whether built for trade or for war, is the embodiment of all the knowledge and skill that has been developed by the science and art of our modern world. The most profound investigations of mathematicians, physicists and chemists, the most refined methods of metallurgists and metal workers, the latest developments of engineering and electricity, and the best skill of a score of trades, have contributed to her design and construction. . . .

There does not appear to be a successor to the master shipbuilder. And yet ships are built and the numerous trades and professions are harmonized and somebody carries the responsibility for the construction. The responsibility may be divided among the superintendent, the naval constructor, and the marine engineer; but unless one of them has the final decision, they must one or all be overridden by a superior, and the one who finally decides stands in the place of the master shipbuilder.

There is no need to-day to dwell upon the necessity of technical training for the naval architect and the marine engineer, and it may be admitted that the superintendent will be none the worse for such a training. . . . Let it be admitted that all these and the master shipbuilder (if there be one) shall be ranked as shipbuilders, together with their assistants and the young men who are growing up in the business, and let us see if there can be found a common body of technical training proper for all shipbuilders, and such as can be given in a technical school or college.

At the Massachusetts Institute of Technology those interested in the teaching of naval architecture and ship design have, during the past three years, tried to attack this problem specifically, not only in the interest of the course in naval architecture already established at the Institute, but also for the further reason that the Institute has been selected by the United States Navy Department as the place of instruction for officers ultimately to be assigned to the corps of Naval Constructors. In preparation for this instruction the whole question of technical training for builders of ships—whether merchant ships or ships of war—has been gone over afresh. . . .

A study of the training fitting for any branch of shipbuilding will show that the bulk of the technical preparation may be in common, whatever divergence may appear necessary to provide for specialties. The basis of such a course for a naval architect or a marine engineer, will be mathematics, chemistry and physics, just as for any engineer. . . . Both will need substantially the same training in applied mechanics and strength of materials, combined with work in the laboratory. . . . Let us add to the common stock descriptive geometry and mechanical drawing. . . . And since both naval architect and marine engineer have to do with machinery, their training must include mechanism and dynamics of machines.

Now comes the question of steam engineering. The marine engineer must, clearly, have all he can get, and if the naval architect is to understand his coadjutor he must know so nearly as much as to justify his taking the rest. This appears, in any event, to be the view of American schools of Naval Architecture, and in this they have the support of the Ecole du Genie Maritime at Paris. Having expressed the idea that the naval architect, the marine engineer, and the superintendent should all be shipbuilders in the broadest sense, consistency requires us to accept the conclusion that the naval architect should, in his turn, have a good training in marine engineering. . . .

The regular courses of nearly all American technical colleges are of four years' duration, it having been found that, taking young men as they come to these institutions from the fitting schools, this period suffices for such a training as enables them to do successful work in their professions. Courses for naval architects are comparatively recent, but graduates from such courses have had the same experience. In other words, it is the opinion of those in charge of these courses in the Institute of Technology that a successful foundation of training in naval architecture and marine engineering can be attained in four years. They go further, and express the opinion that for the majority of young men it is preferable to complete their schooling in four years, and to gain the remainder of their education in actual practice. For those who wish to widen their theoretical training by the addition of courses in electricity or other subjects, graduate courses are proposed.

The course at the Institute leads to the degree of Master of Science after a fifth year given especially to warship design and steam and electrical engineering.

The second paper was

THE TRIALS OF THE SCREW FERRY-BOAT "EDGEWATER."
By E. A. Stevens and C. P. Paulding.

Trials were made first with one screw astern; second, with the same screw ahead; third, with both screws. The results are given in the form of three tables, showing 15 trials with one screw pushing, 18 trials with one screw pulling, and 19 trials with both screws in action. With one screw pushing the highest speed run was 14.75 statute miles per hour, with 1,020 indicated horse-power. Other results: Speed 14.52, h.p. 949; speed 14.42, h.p. 1,015; speed 10.18, h.p. 210; speed 10.11, h.p. 225; speed 7.87, h.p. 120.

With one screw pulling the best speed was 12.94 statute miles per hour with 970 indicated horse-power. Other results were: Speed 12.45, h.p. 811; speed 10.14, h.p. 346; speed 7.15, h.p. 146.

With both screws the best speed reached was 13.51 knots per hour with 824 indicated horse-power. Other results were: Speed 13.36, h.p. 736; speed 10.11, h.p. 327; speed 10.13, h.p. 271; speed 8.12, h.p. 141.

Of course, the results quoted here can give but a very imperfect idea of those which are recorded.

The third paper was

WHY IT TAKES SO LONG TO BUILD A NAVAL VESSEL,
By George W. Dickie, Esq.

. . . While it might be considered as taking somewhat of a risk to let such a cranky subject loose amongst the members of this Society, yet we will endeavor to give it sufficient metacentric height to keep the right side of it up. . . . In considering certain causes of delay in building naval vessels, the relationship of the superintending naval constructor, or the senior inspector of machinery, to the contractor, may, of necessity, require to be discussed, and in this connection the author desires to state that in his opinion, based on a somewhat extended actual experience, no other government can boast of a finer staff of competent naval constructors and marine engineers, in charge of new work under construction for its navy, than that of the United States Navy Department. In fact, the ability of the superintending naval constructor, or senior inspector of machinery, is often quite embarrassing to the simple shipbuilder. We have often been astonished at the almost supernatural ability of the young naval constructor to acquire knowledge on subjects outside of his own profession. . . . We have admired this remarkable faculty, because it is so rare outside of those whose talents are exclusively controlled by the Navy Department. . . .

One of the most important causes of delay in the construction of naval vessels is the habit which has hitherto prevailed of designing such vessels while they are under construction. . . . One of the most recent specifications issued by the Navy Department requires that 25% of the most important items in construction should be built as directed, which means that at the time the specifications were written no one connected with the design for the vessel could write down distinctly just how that design was to be carried out.

The shipbuilder would like to carry out the work just as he thought it should be carried out when he made his estimate of cost, but between him and that honest purpose of his there stand the superintending constructor and his numerous assistants, and after them, the bureau

they represent. Plans are made, only to be returned over and over again as unsatisfactory, and what seemed plain enough to the simple-hearted shipbuilder when making his estimate, becomes now so complicated that the first year's time of the contract is lost in finding a way to carry out the contract.

. . . There should only be one naval architect responsible for the design of the vessel outside of her propelling machinery. Now we have three parties trying to do the work. The bureau of construction and repair, the superintending constructor, and the shipbuilder, and much time is lost in trying to harmonize the ideas of these three parties to the design. As the bureau of construction must finally decide, the time expended by the other two parties is in many cases simply time wasted, and retards construction work on the vessel.

Another cause of delay which especially affects those shipyards situated on the Pacific Coast, and far removed from the main sources of material supply, is the rigid requirements of the specifications in regard to the testing and acceptance of materials to be used in construction. It is impossible to order and have on hand every class of material that may be required, and it is quite immaterial in regard to a great deal of the material whether it really meets all of the requirements of the specifications or not. Why should steel material that is under no stress, and cannot possibly be brought under any, be tested just as carefully and rigidly as material that of necessity is always under severe strains? We have seen chocks and distance pieces, for which cast-iron would be just as good as any other material, rejected, and the work delayed, until other material was obtained that would meet say a high tensile test, when its function in the structure was simply to stand a little compression. We feel sure that in regard to such questions the constructor at a Navy Yard, where a warship is being built, will be obliged to use a good deal more common sense than he thought necessary to fulfill his duties at a private yard. . . .

Methods of doing work in the shipyard vary so much in the different yards, that much time is often lost by the superintending constructor trying to make the yard practice where he now is conform with the methods he has seen used in other yards where he has been superintending for his bureau. Interference of this kind, however much importance it may have in the opinion of the naval constructor, is sure to cause delay and loss to the builder, without any corresponding advantage to the character of the work. Every yard that has accomplished anything has its own methods of reaching a desired result. . . .

We have often seen work being prosecuted to reach a certain result in the construction of a naval vessel stopped, because the naval constructor desired to consider the possibility of reaching the same result in another, and perhaps more direct way. There may have been 20 ways by which the same result could have been reached, and work may be stopped for six weeks while the superintending constructor is in search of the shortest way, and yet by the longest of all the 20 ways the work might be done in a week. This is no fancied condition existing only in the mind of the writer; it is the normal condition under which construction work is carried on at a private yard, on naval vessels, and it is one of the most serious causes of delay that the builder has to contend with, and the most difficult one to make claim in regard to, as the intention of the naval constructor is to help and not to hinder the work.

. . . We will be very sorry indeed if anything in this paper should be considered as a reflection on the naval constructors. We know them so well, and they know us so well, that we have no fear that anything we have said in this paper will be misunderstood. In every struggle the writer has had with the naval constructor, it has been his misfortune to be defeated, not because his case was bad, but simply because the constructor's skill was superior to his own. But if we lost our case, we never lost our friend, in a tussle with the constructor.

A long and important paper was on Water Tube Boilers in Merchant Service by Mr. William A. Fairburn. This paper we shall probably reprint at some length in a later issue. Other papers were on Longitudinal Bending Stresses on Damaged Ships; Problems on the Services of Buoyancy and of Waterlines; Vibrations of Steamships; Developments of Modern Ordnance and Armor; New Designs of Naval Vessels; The Tactics of the Gun; Measurement Rules for Yachts and The Balancing of Valve Gears.

Self-Cleaning Locomotive Front-Ends.

An abstract of the paper presented to the Western Railway Club, Nov. 18, by Mr. Frank Slater, Master Mechanic, Chicago & North Western, was printed last week.

Mr. J. Snowden Bell, Pittsburgh, Pa., who presented a paper on front-ends to this Club in September, 1899, sent the following as a contribution to the discussion of this subject:

"I have read, with much interest, Mr. Frank Slater's paper on 'Self-Cleaning Locomotive Front-Ends,' and do not see how any fair minded and unprejudiced motive power man can fail to endorse the views which he expressed. They are not only fully in accord with the most recent and advanced practice, but are also based on sound mechanical principle and good common sense. Railroads have for a long time been the victims of the 'extension front' habit, and as, like other bad habits, it is difficult to break abruptly away from, the gradual process of reform which is known as 'tapering off' is that which is being generally adopted. While progress towards correct practice in this direction is somewhat slow, it is none the less sure, and papers of the character of Mr. Slater's will help to expedite it.

"The absolute fallacy of the 'spark retaining' theory, upon which the claims of advantage of the extension front are chiefly based, has been so long ago and so fully demonstrated in railroad service that it is difficult to understand how anything other than prejudice or mere force of habit keeps the extension front out of the scrap pile. It is too obvious to need argument, that after an engine having a supposed 'spark retaining' extension front has run a few miles, and banked up a small quantity of cinders at the front of the extension, the cinders are thrown out during the remainder of the run, and, as stated by Mr. Slater, 'over a greater portion of the division the engine is being operated with what might be termed a self-cleaning front-end,' and the engine 'soon converts itself into a self cleaner.'

"The view of Mr. W. H. Lewis, Superintendent Motive Power, Norfolk & Western R. R., which is quoted in my 1899 paper, to which Mr. Slater refers, is so directly in point in this connection that I desire to again call attention to it. Mr. Lewis says:

"'It was found that our long extended front accumulated the maximum amount of sparks in a distance of 10 miles, in heavy mountain service, which represented that all of the sparks which entered the front-end after that time were necessarily thrown out. We, therefore, felt that little advantage might be expected from simply storing the sparks that would accumulate in going a distance of 10 miles, and running a further distance of 50 or 60 miles without any further accumulation, and that it was thoroughly logical to adopt a device which would relieve the front of sparks entirely.'

"To sacrifice the *positive* advantages of freer steaming and reduction of back pressure due to the employment of a larger nozzle, which are attainable with a short front, for the *doubtful* one of transporting a small quantity of cinders to a terminal in an extension front, would not appear to be either good policy or good practice. That all the area of netting which is necessary can be located in a short front, has been conclusively demonstrated on numerous roads, as has also been the absolute uselessness of the cinder hopper, an additional nuisance developed by the extension craze. If Mr. Slater will conduct experiments to determine how short the front-end can be made to give the engine a sufficient amount of netting for free steaming, as referred to on page 3 of his paper, I am sure that he will find a length of 28 in. from center of exhaust to front will be ample for the purpose, and will give better steaming than with a greater length of front.

"Turning to actual practice, in which 'nothing succeeds like success,' we find the short self-cleaning front-end to be adopted in what I believe to be the best and most intelligently designed locomotives in existence, viz.: Mr. Marshall's 2-6-2 type of heavy fast passenger engines on the Lake Shore road. In these engines, the distance from center of exhaust to front is only 30 in., and in the latest design of six-wheel shifters with wide fire-box, on that road, this distance is 28 in. No cinder hopper is used or needed on either of these types, and the exhaust nozzles of the 2-6-2 engines are, I believe, 5¾ in. Their steaming qualities are admittedly of the best, and if any engines with 'spark retaining' extension fronts equal them in this regard, or surpass them as to cleanliness and freedom from fire throwing, the evidence to that effect has yet to be produced."

The opinions of the majority of the members participating in the discussion agreed with those expressed in the paper regarding extension fronts and self-cleaning front-ends.

Mr. Kastlin (C., B. & Q.) said the front-end they were using enabled them to run 160 miles with one cleaning, the spark arrester really serving the purpose for which designed. Mr. Willsie reported runs of 126 miles without requiring cleaning. One member suggested that if the use of the extension front is to be continued that it be equipped with an ejector, to be operated from the cab so that the engineman could blow out the cinders whenever necessary.

Mr. Manchester (C., M. & St. P.) was rather opposed to any self-cleaning front-end except it be of the kind where the sparks are kept out of it entirely by being burned up in the fire-box, and he thought this the best direction in which to work. If sparks got to the front-end he thought they should all be caught. The present extension front does not catch sparks enough and he favored seeing it provided with a cellar that would catch practically all of the sparks.

Foreign Railroad Notes.

A Russian railroad has filled a long-felt want by building what we may call a "honeymoon car," fitted up with all the splendor of the "bridal chambers" of the great hotels and of the "bridal staterooms" when the Mississippi River steamboats were in their glory.

Steps having been taken to organize a Union of Austrian Locomotive Engineers, the Minister of the Interior forbade the formation of such a union on the ground that it would be a danger to the state. The organizers appealed to the Imperial Court, alleging that such a prohibition was a violation of their political rights. The court has decided that the prohibition by the ministry was legal and well founded.

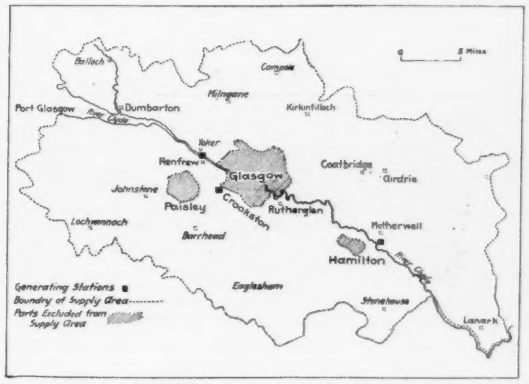
The railroad in Cochin China which the French have built from Haiphong, the chief port of Tong-King, to Hanoi, the chief city, 62 miles, was opened for traffic last June, having been completed within eighteen months. At Hanoi it crosses the Red River by a bridge 5,500 feet long. A further extension 38 miles long from Hanoi to Loakay, on the Chinese border, is to be completed next year. In the French territory there are now in operation, besides the above, a railroad 46 miles long from Saigon to Mytho, and one 102 miles long from Hanoi to the border of the Chinese province of Kwangsi.

The Swiss State Railroad management has made set rules for the heating of station waiting rooms. From the first of October till the end of April they are to be warmed whenever the outside temperature falls as low as 50 deg. Fahr. From Dec. 1 till the end of February the heating must be continuous, whatever the outside temperature, unless for three successive days and nights the outside temperature has not fallen below 50 deg.

Women tend the crossing gates at many German crossings, and it has come to light that the officially-appointed woman has sometimes set her servant girl to attend to the gates. This, says the Minister of Public Works, must not be permitted; the women appointed must themselves attend to their duties, like all other employees.

Power Distribution Near Glasgow.

A bill has recently been sanctioned by Parliament, which gives authority for an extensive power distribution scheme contemplating supplying power to the industrial region of the Lower Clyde. The district covered by the bill includes that part of the Clyde valley extending about 10 miles on each side of the river and about 20 miles up and down stream from Glasgow. The area covered is about 700 square miles, and three generating stations



A New Power Scheme in Scotland.

will be built. The scheme has been promoted by a group of manufacturers who estimate that power can be made cheaper by a common system than by individual plants.

This region is the busiest part of Scotland and contains about 1,200 works, many of which are large iron and steel works, coal mines, shipbuilding yards, and chemical works. The three generating stations are to be built at Motherwell, Yoker and Crookston. The Motherwell station is in the neighborhood of a large number of manufacturing works and in the center of an extensive coal field, and can be connected with the adjoining line of the Caledonian Railway. It is also close to the Clyde, from which water for steam and condensing purposes can be drawn.

The Yoker station is also on the Clyde, near the line of the Lanarkshire & Dumbartonshire Railway, and is close to a large number of shipbuilding yards, works and docks. Authority has been obtained to lay cables across the Clyde from Yoker to Renfrew, which will enable the works at Renfrew, and other works on the south side of the river, to be supplied from this station.

The third generating station will be situated near Crookston on the Glasgow & South Western Railway canal line; but, owing to the arrangement allowing the company to cross the river, it will not be necessary to build this station immediately.

The Motherwell and Yoker stations are the first to be built, each to have about 4,500-k.w. capacity, with provisions for enlargement. When the stations are in operation, they will probably be coupled together electrically. The capacities of the respective stations will ultimately be about 10,000 k.w. each at Motherwell and Yoker, and 5,000 at Crookston. By utilizing cheap sites for the stations outside of towns and near to the coal mines, it will be possible to generate power at a very low cost. Of the 710 square miles covered by the scheme, only 13 are at present supplied with electricity.

The authorized capital of the Clyde Valley Electrical Power Company is $4,500,000, with borrowing powers of $1,500,000. The total cost is estimated at over $2,000,000. The electrical apparatus will be supplied by the British Westinghouse Electric & Manufacturing Co. Messrs. Strain & Robertson are the engineers of the power company.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The compilation of gross earnings for the month of September as made by the *Chronicle* shows a gain as compared with September of 1901 of 8.64 per cent. This is for 108 roads and the absolute gain was $8,615,000. In net the gain was 2.47 per cent., or a little less than a million dollars. September of this year had one more working day in it than last year, but last year the Pan-American Exposition added to the passenger earnings, while this year the anthracite strike and the soft coal strike in the Chesapeake & Ohio fields acted to reduce earnings. The gain in September, 1901 over 1900 was 10.88 per cent. in gross and 12.45 in net.

Last Sunday witnessed probably the largest freight movement within a limited territory—or within any territory—that was ever heard of. The Pennsylvania and the other roads centering in Pittsburgh made an "advance all along the line" and appear to have put every available man and engine at work that day, with a view to "getting a hole through" the many yards in and within 50 miles of that city which have been blocked with cars for the past three months. The reporters estimate that during the 24 hours ending at 5 o'clock Monday morning the number of freight cars moved to and from Pittsburgh was 46,225, in 929 trains, as follows: Pennsylvania Railroad, 294 trains, 14,700 cars; Fort Wayne, 180 trains, 9,000 cars; Pan-Handle, 245 trains, 12,025 cars; Baltimore & Ohio, 90 trains, 4,500 cars; Pittsburgh & Lake Erie, 120 trains, 6,000 cars. We use the reporters' figures because the railroads do not give out any; and in calling this the greatest movement ever known we base the statement, of course, on general facts which are well known, not on any precise records. That the ordinary freight tonnage of Pittsburgh is larger than that of any other city in the world is, we believe, generally acknowledged. That every line entering the city has for months had a movement beyond its capacity is also well known. The Pennsylvania, with its great resources, can undoubtedly gather and use more locomotives in that city at one time than could be usefully gathered in any other territory of the same extent in this country. It has three four-track and three or more two-track railroads centering there. The Baltimore & Ohio, the Pittsburgh & Lake Erie, and the Bessemer & Lake Erie have facilities commensurate with the needs of the traffic, or rather with what were the needs a short time since. These facts, in connection with what is known as to the desperate conditions of some of the great furnaces, which have had to shut down for lack of coal, coke, or limestone, enable one to readily believe that the efforts which were put forth on this occasion—and the results—surpassed all previous records.

While it is impossible except by the use of maps, tables and many statistics to make an adequate exhibit by which the reader may grasp the Pittsburgh situation, there are some incidents that quite clearly illustrate it. For example, it is said that many carloads of eastbound live stock, unloaded at Pittsburgh to be fed, have had to wait a week or more before they could be sent forward. This would seem to indicate that the reports about the pressing needs of the furnaces have not been exaggerated. A team-track yard in Pittsburgh, with a capacity of 250 cars, is being used to its full capacity—cars unloaded apparently as fast as usual—and yet there are constantly 300 loaded cars waiting to be taken in. This indicates the increase in the capacity of the population of Pittsburgh, after their long succession of fat pay-days, to consume vegetables, fruit and various luxuries which in other times would have been demanded in very much smaller quantities. As was said by one of the railroad officers at the recent Interstate Commerce Commission hearing in Chicago, it is a wonder why the railroads do not increase their rates on some commodities. With a pressure lasting many months, in a territory where, with the best possible efforts, the tracks, yards, locomotives and forces of trainmen cannot be increased for many more months, an advance in rates is really the only way by which the carrier can think of treating his customers equitably. For the railroad superintendent to use his own judgment as to what shipper shall wait the longest is an exceedingly crude method. But while the railroads have done little or nothing to adjust transportation rates to the demands of the business, they have done a little in one direction; that is in the matter of the collection of demurrage on bulk cars, so as to prevent some of the abuse by which cars have been used as storehouses. This is one of the good results of the per diem interchange rules. Unfortunately, this reform does not touch all of the freight-car abuses. In Pittsburgh as in other large centers there are thousands of cars which are not owned by the railroads and on which, therefore, the pressure to get them unloaded is not so strong as it ought to be.

Recent Discussions on Discipline.

The papers on discipline read at the New York Railroad Club's November meeting were practical in tone and substance and were by men with whom the subject is a fresh one; men who have had occasion to test their theories in the management of considerable bodies of new and old employees. We regret that we have not space for the whole of all of the papers.

The usefulness and adaptability of the Brown system of discipline is the principal point on which the two first speakers have left room for discussion. Mr. Ketcham's approval of it is so qualified as to be practically a disapproval; while Mr. Wheatly approves the "underlying principle," but adds that this is nothing unless the men are enthusiastic in their several vocations. The mention, by these and other speakers, of "modifications" of the system means, in the plain language of Mr. Ketcham, that the system has been "juggled;" that some disciplinarians have made the rule of non-suspension a cloak for neglect of the essentials of true discipline. We judge that this accusation has considerable basis of fact. At all events it has always been pretty plain that the success of Mr. Brown himself was due, not simply to the abolition of suspension, but to that *and* the employment of instruction, reproof, conference and the friendly attitude on the part of the superintendent toward the employees which meets Mr. Ketcham's demand that "the officer try to build up the man."

In short, good discipline cannot be had merely by the operation of a machine; some strong man must put his personality into it; and this means a good lot of hard work. A strong man is needed because with all the friendliness there must be—as an ingredient in the friendliness—the sense and the courage to be severe with inefficient men when necessary; not a year after the necessity is apparent. A bad employee—one with no conscience—or an unfortunate one—one with the wrong type of brain—should not cumber the service for months while the superintendent is waiting for an automatic rule to slowly work out the man's doom. He should be got rid of promptly.

Beginning on the first of next January the Illinois Central will change the method of discipline for employees of the transportation department. The new system will be a compromise between the Brown system of record suspension only, and the old actual suspensions for misconduct. The men are to be divided into two classes. Class A men will be those who have worked for the company two years, and who have less than 60 days' record suspensions against them. Class B will include newly hired men and those failing to gain Class A. Class A men will be suspended only on record, and will lose no actual time. Class B men will lose all time for which suspension is ordered. Records may be cleared by 30 days' perfect service for five days on the record against the employee; six months good service for 30 days; one year for 60 days, etc.; and an old employee who goes into Class B can get out of it by clearing his record as here provided for.

This would seem to be a very sensible method of meeting the objections which are sometimes alleged against Brown's discipline, that it is inadequate because there are men in the railroad service who are not amenable to reason and discussion, and who therefore are affected by nothing less potent than the disgrace and the financial loss incident to an actual suspension. A two-year probationary period gives the employer time to get rid of men who cannot be suitably disciplined by books and interviews. Certainly a man who does not appreciate the advantage of avoiding idleness when he has made a blunder which should naturally worry him, cannot be a very desirable person to keep in the service in any department. The employer will doubtless suffer less harm from an idle new man hanging around the lobbies and engine-houses than would be the case if the idle person were an employee of long standing; for the latter would be much more likely to scatter seeds of discontent by making other employees listen to his grievances.

A significant clause in the new Illinois Central regulations is that in which Class B men, who are to be suspended, with loss of pay, for misconduct, are told that their suspensions will be recorded. This is a reminder that losing your time does not repair the damage that you have done. One of the most mischievous notions that can get into an engineman's or a conductor's head is that by lying off a week or a month he fully squares himself with the company. Men who cherish this idea will object to "record" suspensions because, they say, they have their past misdeeds constantly hanging over them; and for this reason they desire the continuation of the old method. The superintendent who means to improve his men to the highest degree will see that this notion is exploded. Losing your time does not help the company, because another man has to take your place, and he must be paid. Even if the company got the benefit of $100 lost by an employee that would not offset a $500 or $5,000 loss by a wreck, nor would any financial benefit enjoyed by the company make up for having in its employ a careless or incompetent man. If his carelessness or incompetency is to be cured it must be by some other way than by giving money to the company.

The fundamental question, as between Brown's discipline and the other kind is, which plan will best cure a man of his faults; to take 10, 30 or more days off to reflect on the subject, or to keep at work and do the reflecting while on duty—or before breakfast in the morning? Whichever plan is adopted, it is the company's duty to keep a record of the case, for the man's future efficiency is the main thing in which it is interested; and it is dangerous to trust entirely to memory in such matter.

Two minutes or thirty days; this is the alternative presented to trainmen by one strict disciplinarian, who has recently put in use some automatic block signals. At outlying switches there are no indicators, and the rule is that if a train wishes to enter the main track at such a point, the circuit holding the signal at clear for that section must be opened and kept open two minutes before the main track is occupied or fouled. This is to give time to see whether an approaching train had not entered the section just a moment before the circuit was opened and the signal set to stop trains. Disobedience of the rule results in 30 days' suspension.

While on the subject of discipline we wish to mention this, as an instance of a kind of action which has in it much to commend. We did not inquire whether the suspension was actual or "book," though we believe it was the former. That, however, is secondary; the main idea is to punish dangerous practice, whether it results in actual danger or not. If it takes 60 days or 100 days on a book, to equal 30 days actual suspension, then 60, or 100, is the figure that should be used. Innumerable accidents

have happened from negligence which has been the result of the leniency of a superintendent who because a lapse lasted only two minutes lacked the "sand" to punish it.

On this matter of indicators at switches the interested reader will have noticed, from the account which we published November 14, page 871, that the Lackawanna road has taken out 150 of them. If the indicators get out of order they will keep switching crews waiting for passenger trains that never come, and thus waste time and tend to impair the authority of the rules. This is a case where the code should strictly conform to the dictum formerly included in the introduction to the standard code "A rule which cannot be enforced ought not to exist." As the two-minute rule—or a rule specifying some definite interval—ought to be prescribed, even with indicators in use, it would seem that with adequate discipline the Lackawanna's arrangement ought to give entire satisfaction. The fact that opinion is so divided, as between audible indicators and visual, is also in favor of the abolition of both kinds.

Signaling Under the Government.

The British Board of Trade has lately issued two accident reports which throw interesting side lights on signaling practice as it is carried on under the fatherly surveillance of the Board—in which surveillance there are, it seems, a few loopholes, here and there.

The first report is on a collision at Gorbals junction, just outside St. Enoch's station, Glasgow. Here there are four running lines with a junction from one pair of up and down lines to the other. A freight train was crossing from one down line to the other at the same time that a passenger train was approaching on the latter line. The signals were necessarily against the passenger train; but the engineer seeing the signal off for the freight forgot that it was not his signal and went ahead, causing a collision.

The Board of Trade inquiry into this case revealed that the railroad company had not permission from the Board to depart from absolute block working at this point. It was claimed that such exemption is necessary owing to the large amount of traffic, but the sanction of the Board of Trade ought to have been first obtained. The Inspecting Officer also draws attention to the fact the signals at Gorbals are badly arranged, as the four signals for the two down lines are placed together instead of the signals for one line being grouped apart from the signals for the other line.

The second accident was on the North Eastern at Newcastle, and the mishap was exactly similar to the one at Gorbals, except that here the signal for the passenger train was off while the switches were set for the cross-over from the up passenger to the up freight line. This was due to the facing point connections failing, but the signal could not have been cleared had not one of the standard requirements of the British roads been omitted. It is the practice to provide at facing points what are known in England as "detectors" and in America as "bolt locks." These are plungers coupled to the signal wires which are threaded through the facing points and guarantee that the points are set for the proper direction before the signal can be lowered. These had not been provided at Newcastle and consequently the signal for continuing along the passenger line could be lowered although the points were lying for crossing to the freight line.

Perhaps the most significant aspect of this matter is the evidence, which such incidents afford, that Government regulation of railroads cannot very effectively deal with the utmost refinements. Although Parliament is not too great a body to put into legislative acts the most minute details concerning railroad operation, the difficulty of controlling details by hard and fast rules still remains. The block system must be suspended here and there—at least that is the decision of conservative superintendents—and so the law breaks down. It is not, perhaps, to be regarded as a serious break-down, yet it is sufficient to give warning of the danger of putting into the statute book requirements that cannot be carried out. Whether the railroads run the risk of mild violations, or the Government official winks at them, makes little difference. In the matter of bolt-locks, probably there is a difference of opinion as to whether they are really economical. The English laws concerning safety appliances and methods are about on a par with the law in Texas concerning freight rates—where the sovereign power of the State, in the persons of its three railroad commissioners, sometimes has to hold a session, with the proper accessories of governmental dignity, to decide whether a buyer of scrap iron or a collector of cider-apples, shall be granted a special reduced rate on a single car in order to enable him to consummate a good trade. Paternal government must often be very tiresome.

Two thousand seven hundred and seventy-three is the number of employees in certain classes on a great English railroad who during the month of December last were on duty more than 12 hours at a time; and this and other cognate facts, reported by all of the railroads in the United Kingdom, go to make up a Blue Book which has just been issued by the British Board of Trade in pursuance of Section 4 of the law of 1889. The number mentioned constitutes 67 per cent. of the total number employed by the company in the occupations under consideration; namely, trainmen, signalmen and examiners, which latter means, we suppose, car inspectors. The percentage of trainmen thus overworking was 90 per cent. In giving the extent of the overwork required the report shows the number of instances, not the number of persons. The number of instances in which men worked as much as 17 hours, on the road from which the above figures were taken, was 1,441; the number of instances in which the time was 13, 14, 15 or 16 hours is in each case a good deal larger than this. In the 17-hour class 1,124 out of the 1,441 were enginemen and firemen of freight trains. Only one of the instances is set down against signalmen. The report also gives the number of instances in which, when the employee had been on duty more than 12 hours, duty was resumed after less than nine hours' rest. Referring again to the same road (this one is by no means exceptional), we find that 926 of the men who overworked resumed their duties within less than nine hours, but only nine of these resumed after less than seven hours' rest. The report shows, in the cases of the principal roads, that the number of enginemen and firemen is very much larger than the number of guards and brakemen. On one road there are 329 passenger guards and brakemen and 680 passenger enginemen and firemen. In the freight service the excess of enginemen and firemen is not quite so large; but it is more than 50 per cent. in excess of the number of trainmen. If the guards and brakemen do not work more than 12 hours a day it would appear that there must usually be only one trainman to a train (behind the tender), and, moreover, that the enginemen must usually work much less than 12 hours a day. A number of the roads have sent letters, with their returns, explaining the reason why the number of men working overtime appears large. The month selected (December, 1901,) is said to have been the worst that could have been found. There were dense fogs for several days, and on the 13th there was a violent gale which blew down many telegraph poles. Two general managers say that block working had to be suspended for many days. In the week before Christmas one road had 25 relief guards off duty, in one district at the same time, on account of sickness. A prominent Scotch railroad gives a list of heavy snow storms—seven of them in the course of the month.

A correspondent of the *Telegraph Age* wishes to know whether or not it is within the province of his employer's interest to know whether he (the employee) is married or single, whether he saves his money and pays his debts or whether he squanders his earnings; whether he is lazy or ambitious; whether he is clean and tidy, or dirty and slovenly; whether he understands the instruments he works or whether he depends upon the chief operator to adjust his relay or balance his duplex or quadruplex; whether he is generally liked or disliked by other employees; whether he progresses in knowledge or stands still; whether he is a grumbler and kicker, or a cheerful worker? The reader of the *Railroad Gazette* will recognize this as a thinly veiled criticism of a paper recently published in these columns advising railroad superintendents to post themselves as to those characteristics of employees which are here mentioned. As the editor of the *Telegraph Age* does not reply to the query we will suggest to the man who wrote it a question or two which he may profitably ask of himself. Is it to his own interest to *be* thrifty, industrious, neat, affable and progressive? Is it worth while to acquire such a thorough appreciation of these virtues as to know—not merely to guess or assume—that you possess them, in some degree, and are trying to increase your stock of this kind of wealth? If you know this, what objection is there to letting the superintendent into the secret? It would look as though the employee of a railroad or telegraph company who was really ambitious to prosper would not wait for the superintendent to come around and ask about his good qualities, but would take the most active measures possible, within the limits of propriety, to force the information upon the superintendent's attention.

When the Italian government in 1885 leased the railroads of the country to three great operating companies, it was provided that either party might terminate the lease in 1905 on giving notice as early as July 1, 1903. As this date approaches, it seems probable that both parties will give such notice; but it is not expected that the government will attempt to work its railroads itself, but rather that a new contract will be made with the old lessees. There is almost universal dissatisfaction with the working of the railroads, and the government gets no direct return on its enormous investment; but this is largely because it has built very costly lines in many places where they could not be expected to pay—compelled thereto by political reasons. The country has an enormous population per mile of railroad, but in many parts it is miserably poor. An American railroad manager would be apt to say that there is no freight traffic in Italy; and in proportion to population it is certainly extraordinarily light. Italy has no coal, no important mineral produce, no timber, and its light grain crops are all consumed at home. Coal, etc., brought in can reach ports near all parts of the country. Such manufactures as there are—and they are considerable and growing—are chiefly of light goods. The immense value of the silk produced in Lombardy is striking; but the aggregate weight of the product is almost insignificant. Under such circumstances high freight rates are inevitable, and it would be absurd to expect them to reach a basis as low as in Germany, not to say this country—which is far from saying that certain rates might not be reduced to the advantage of all concerned. The almost universal delay of passenger trains is exasperating, and perhaps more than anything else has put the public out of patience with the companies. The problem is one hard to solve, and doubtless will not be solved satisfactorily.

The remarkable record of safety to passengers on the railroads of Great Britain during the year 1901—no passenger being killed in a train accident during the 12 months—is already familiar to the reader. The returns since issued show that this unusual record was maintained for 15 months; the statement for the first three months of the current year showing no person killed by a train accident in any one of the classes, either passengers, employees or other persons. The return for the second quarter, which has just appeared, shows five passengers killed in train accidents, but no employees or other persons. The number of passengers injured is, however, much larger than in the first half of 1901, the figures being 359 as compared with 172.

NEW PUBLICATIONS.

Transactions of the American Society of Mechanical Engineers. Volume XXIII, 1902. Large octavo, 878 pages, numerous illustrations and index. Prof. F. R. Hutton, Secretary. New York: 12 West Thirty-first street.

Of course, the bulk of this volume is made up of the papers and discussions brought out during the year, but it contains also certain particulars about the Society. We find that the total membership now is 2,425. Of these 1,667 are Members, 566 Junior Members, 174 Associate Members and 18 Honorary Members. The foreign membership is only 153 out of this total. The rules of the Society are also printed in this volume. The reports and papers published are Nos. 914 to 954, inclusive, with 338 illustrations.

Work Done. Pamphlet, 100 pages, folding plates and engravings. New York: Westinghouse, Church, Kerr & Co., 10 Bridge street.

This enterprising firm of engineers and contractors has issued under the title of "Work Done," a pamphlet containing descriptions of some of its important recent work, namely, the Grand Rapids, Grand Haven & Muskegon Railway; the Detroit & Port Huron; the Detroit, Ypsilanti, Ann Arbor & Jackson Railway; the Toledo, Fremont & Norwalk Railway, and the Detroit shops of the American Car & Foundry Company. Of course, the pamphlet is designed as an advertisement, but it is a good deal more than that. It is useful in detailed description of large works and also as an illustration of modern methods of design and execution by great organizations.

TRADE CATALOGUES.

Kopp Solid-Color Glass.—This is the subject treated in "Bulletin No. 9," which has just been issued by the Union Switch & Signal Company, Swissvale, Pa. This company, by arrangement with a large glass manufacturing company in Pittsburgh, has now arranged to supply its customers with all colors and sizes of signal glass of the best quality. Mr. Nicholas Kopp is a glass maker of high reputation and long experience, and he has produced a red pot-glass, "red all the way through," which gives perfect results in signaling. The pamphlet tells of the attempts which have been made to make a good solid-color glass (to obviate the defects of the ordinary flashed red) and contains the report of a spectrum analysis of the red glass. The company keeps in stock all sizes of red, green, yellow, blue, purple and clear signal glasses and will make special types on application.

Pipe Carriers, Etc.—The Pneumatic Signal Company, owner of the Standard Signal Company (New York office, Broad Exchange building; Chicago office, Monadnock block), has issued a pamphlet, being "Bulletin No. 1." This is designed to advertise two articles of the product of that company. The EZ-pipe carrier and the wrought-iron jaw. This carrier is designed for simplicity, durability and ease of installation, and the makers believe that there is no other pipe carrier on the market which can be so easily installed and which provides so well for the quick and convenient removal of the parts. The addition or reduction of a lead pipe can be accomplished without discarding any of the material. For the production of the wrought-iron jaw now made by this company a machine has been designed specially for this work. The upsetting, punching and finishing processes are all carried out with two heats.

The U. S. Metal & Manufacturing Co., 25 Broad street, New York City, has just issued a 32-page catalogue. The company deals in railroad specialties and is selling agent for the Combination steel draft rigging and underframe, U. S. steel truck, Johnson hopper door, Johnson flush box car door, Johnson refrigerator door, Johnson drop gondola door and National adjustable journal bearing; and sole railroad agent for the Cliff & Guibert automatic hose reel. The catalogue contains illustrations and descriptions of these various devices.

Concrete Piles.

A description of the Raymond system for concrete piles was given in our issue of Aug. 15. The company has just completed a contract for concrete foundation for the new Carnegie library at Aurora, Ill., in which concrete column supports were carried to bed rock by the same method employed in placing concrete piling.

There are 142 of these columns which are approximately 14 ft. long, 20 in. in diameter at the top, and 13 in. at the bottom. The medium through which they were driven was filled ground composed of gravel, cinders and earth, and which proved very difficult of penetration. A 2,400-lb. hammer was used, with a height of drop varying from 10 to 20 ft., and the average penetration at the start was only about 2 in. Some 200 blows were required to reach the required depth.

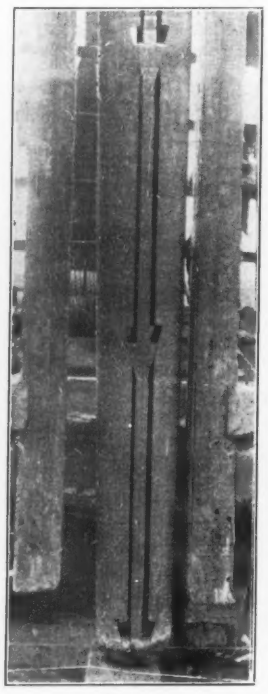


Fig. 1.

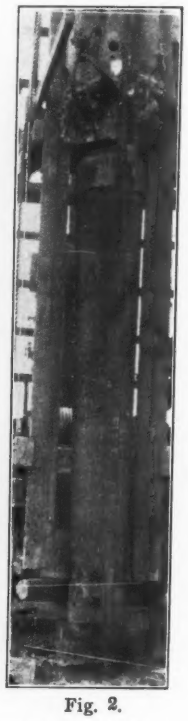


Fig. 2.

Fig. 1.—Part of Steel Core Expanded for Driving.
Fig. 2.—Core Withdrawn from Shell.

Putting in Concrete Piles.

One of the illustrations, Fig. 1, shows a section of the tapered steel core used, the core being expanded ready to drive. The central part is locked in position by two steel keys driven above the topmost triangular enlargement, which is just under the head, as may be seen from Fig. 2. The camera failed to include this part of the core in Fig. 1. Fig. 2 shows the core as just having been withdrawn from the sheet-iron casing after driving. A completed column is seen just to the left of the newly-driven casing.

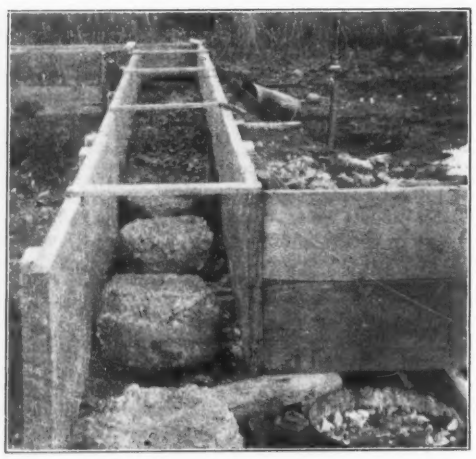


Fig. 3.—Row of Concrete Columns and Boxing for Foundation Wall.

A concrete foundation wall 18 in. high was built on top of the columns and Fig. 3 shows a row of columns with the boxing in place for this wall. The mixture used for columns and wall was 1 of cement, 2 of sand and 4 of stone. The cost of this work was about 20 per cent. less than the lowest masonry bid.

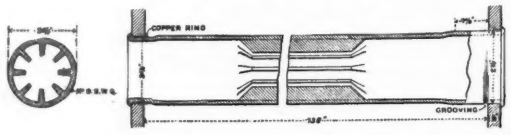
Experiments with "Serve" Steel Tubes.*

In 1897 the Wellington and Manawatu Railway Company procured from the Baldwin Locomotive Works of Philadelphia a "Vauclain" four-cylinder compound consolidation locomotive, No. 16, fitted with "Serve" ribbed tubes, 2¾ in. in diameter, reduced to 2⅝ in. in diameter at the fire-box end and enlarged to 2⅞ in. in diameter at the smoke-box end. The tubes were of No. 9 gage, and were 11 ft. 6 in. in length between the tube-plates, 5 in. at the front end and 4 in. at the fire-box end being plain, and the remainder ribbed. A steel fire-box was fitted, having a tube-plate ½ in. in thickness, the front tube-plate being also ½ in. thick, and well stayed.

From the time the engine was first put in service, a considerable amount of trouble was caused by flues leaking at the fire-box end. This was improved to some extent by keeping a clear fire and an even pressure of steam whilst running downhill, and when standing at the end of a run, but there was still a good deal of leakage. It was noticed that the leaking was much worse after cleaning fires, and as the boiler was fitted with rocking-grates, advantage was taken of this to clean the fire by rocking into the ash-pan. A great improvement resulted, and it was found that, if care was taken to prevent large quantities of cold air from entering the fire-box, the tubes could be kept fairly tight.

After about six months' service, odd tubes began to leak, necessitating expanding some tubes on every wash-out day. Leakage also began to show at the smoke-box end, and on removing some of the tubes it was found that grooving had taken place close to the inside of the tube-plate, in some cases more than half-way round the tube, and almost through the metal, Fig. 1. This occurred chiefly in the two bottom rows of tubes, and extended about half-way round the boiler. These tubes were replaced by new ones, but the same effect continued to recur, and after 12 months' service the author decided to remove the Serve tubes altogether, and to substitute plain charcoal-iron tubes, 2 in. in diameter, of No. 12 B. and S. gage. Since this was done the boiler has given very little trouble. The heat-absorbing surface of the Serve tubes, i.e., the internal surface of the tubes in contact with the hot gases, was 1,235 sq. ft., and the heat-distributing surface, i.e., the external surface of the tubes, was 745 sq. ft., and the total area for the passage of gases was 2.53 sq. ft. In the plain tubes afterwards substituted, the total heat-absorbing surface was 860 sq. ft., and the total heat-distributing surface was 945 sq. ft., the flue area being 2.83 sq. ft.

The fire-box heating-surface was in each case 92.5 sq. ft., and the grate-area 17 sq. ft. The boiler steamed freely both with the Serve tubes and with the plain tubes, but after about 500 miles had been run it was noticeably duller when fitted with the Serve tubes. The Serve tubes were "run," on an average, about twice a week, and the plain tubes once a week. The smoke-box



was fitted with a deflector-plate in front of the tubes, which caused the sparks lodging in the smoke-box to be swept well forward; these were blown out when necessary by means of a spark-ejector. The smoke-box door was not opened except to "run" the tubes. With regard to the relative efficiency of the Serve and plain tubes, the engine, when fitted with Serve tubes, consumed, on an average, 55.4 lbs. of coal per mile, while during the six months after the Serve tubes were removed the consumption was 55.2 lbs. of coal per mile, and for the following year 56 lbs. per mile, or 0.272 lb. per net ton-mile. From this it appears that the 860 sq. ft. of heat-absorbing surface of the plain tubes was as efficient as the 1,235 sq. ft. of heat-absorbing surface of the Serve tubes, or the heat-absorbing surface of the Serve tubes has 69.6 per cent. of the efficiency of that of the plain tubes. The author is of opinion that, owing to leaky flues, the coal-consumption was greater with the Serve tubes than it otherwise would have been.

For the 12 months before the Serve tubes were taken out the cost of repairs was 7.2 cents a mile; for the first year the plain tubes were in service the cost was 6.4 cents a mile (this included the cost of fitting the plain tubes); and for the last 12 months the cost was 3.2 cents a mile.

In conclusion, the author is of opinion that the failure of the Serve tubes by grooving was caused by the ribbed portion being so rigid that all vibrations were concentrated at the front end, which is the thinnest and weakest part of the tubes, and that if, instead of the internal diameter of the tube being increased where it passes through the front tube-plate, it were kept parallel and the thickness of the metal back to the ribbed portion increased, better results would be obtained.

*Abstract from a paper presented to the Institution of Civil Engineers by Mr. James Marchbanks. *Proceedings*, 1901—1902, vol. 60.

TECHNICAL.

Manufacturing and Business.

The Walker Car Replacer Co., St. Paul, Minn., Frank C. Towns, President, has moved into much larger offices in the Ryan Building.

The Chicago Pneumatic Tool Co is preparing to build a big tool plant in Fraserburgh, Scotland. President J. W. Duntley is now in London.

The National Air-Brake Co. was recently incorporated in New Jersey with $250,000 capital stock. Robert T. Horn, D. B. Dougherty and Albert Odell are incorporators.

The Portsmouth Pressed Steel Co. has just finished a shop 51 x 108 ft., at Portsmouth, Ohio, where it will make car replacers after the Pritchard patent. J. W. Ricker is President.

The Edgar Car Lock and Seal Company has been incorporated in New Jersey with a capital of $1,000,000. Incorporators, Millard W. Baldwin, Gerald A. Griffin and Frank R. Serles.

The Central Car Co., which is controlled by the Wisconsin Central R. R., has received permission from the Superior Court in the State of Connecticut, to wind up its affairs and cancel its capital stock.

Work on the power plant for the electrical equipment and for the heating system of the Oak Grove, Pa., shops of the New York Central is well under way. The contract for this work was let to the Arnold Electric Power Station Co., Chicago, and it is expected that the shops will be put in commission before the first of the year.

The Dayton Malleable Iron Co., Dayton, Ohio, has been reorganized. W. B. Earnshaw, who has been the Vice-President and General Manager, was elected President to succeed the late R. C. Schenck. Pierce D. Schenck was elected Vice-President and Assistant General Manager, and W. H. Cassell was elected Secretary. O. J. Needham was elected a member of the Board of Directors to fill the existing vacancy.

Charles Parsons, who has been for a long time engaged in railroad mechanical work and in the sale of engineering and railroad supplies, has now connected himself with the Chicago Pneumatic Tool Company and will travel for them in the interests of their tools. Mr. Parsons was for some 13 years with the railroad lines now comprising the Erie system, and also a number of years with the Tiffany Refrigerator Car Company.

Iron and Steel.

The Damascus Nickel Steel Co., of Wilmington, Del., has been incorporated with $1,150,000 capital by Josiah Marvel, Ralph C. Lupton and others, of Wilmington.

The Department of Railways and Canals, Canada, is advertising for 25,000 tons of 80-lb. rail for the Intercolonial Ry. The bids to be opened Jan. 15.

G. F. Meehan, President and General Manager of the Monterey Foundry & Machine Co., of Monterey, Mex., has resigned and is succeeded by F. J. Llewellin, of St. Louis, Mo.

A contract is reported to have been placed with French mills for 12,000 tons of rails for the Santa Fe Railroad. The contract price is said to be about $22 f.o.b. Antwerp or Dunkirk.

After several months' negotiations, the Austrian and Hungarian iron and steel industries have succeeded in forming a consolidation of 23 establishments, the capital of which aggregates $70,000,000.

The Canada Steel Shafting Company, Limited, with headquarters at Toronto, Ont., has been incorporated. The provisional directors are: Samuel May, Henry S. May, Charles F. Wheaton and Reginald A. Fraser.

The Ottawa Steel Casting Company, Limited, has been incorporated with a capital of $250,000. The officers are: President, Dr. John A. Hunter; Vice-President, Jas. G. Maclaren; Secretary-Treasurer, J. H. Gervan; General Manager, George G. Roe.

Bridges on the Iowa Central Railway.

Bridges over Lime Creek, Timber Creek, South Skunk River and Chariton River were built during the early summer, and were reported in these columns last year at the time the contract was made. There are now being erected the following bridges for the Iowa Central: One through plate girder, 67-ft. span, and one through plate girder, 87-ft. span, both ballast floor; two through riveted truss, 136-ft. span; one through riveted truss, 140-ft. span; one through riveted truss, 150-ft. span. All of these structures are to be placed upon new concrete masonry, and contracts have been let and most of the material has already passed through the shops.

The Brooklyn Bridge Terminal.

The Brooklyn Rapid Transit Co. has let the contract for installing four additional loops at the Manhattan end of the Brooklyn bridge to the American Bridge Co. The work will begin in a couple of weeks. Trolley traffic will not be interrupted.

Traffic on the Brooklyn Bridge.

The Brooklyn Rapid Transit Company had a 24 hour count made of the passengers crossing the Brooklyn Bridge between midnight Nov. 9 and midnight Nov. 10. The total number carried in the cars of the Brooklyn Rapid Transit Company was 307,297. This was the total movement both ways.

Cincinnati Equipment Company.

The old Riverside plant of the American Tin Plate Co., just outside the city of Cincinnati, Ohio, has been bought by the Cincinnati Equipment Company, and will be used hereafter as a plant to make railroad supplies and rebuilding locomotives. The Cincinnati Equipment Co. was incorporated recently by A. W. Goldsmith, Emil Jacobson, Harry Henke, Eugene Brunsman and Frank Fronhold. About $75,000 will be spent for machinery and equipment.

Union and Sharon Steel Companies Consolidated.

Negotiations have been completed for the consolidation of the Union Steel Company's works at Donora, Pa., owned by the Mellon interests and Mr. W. H. Donner; and the Sharon Steel Company's interest, control of which is owned by John Stevenson, Jr., William Flinn, George W. Darr and others. The new company will be known as the Union Steel Company, and will be capitalized at

$50,000,000. Mr. A. W. Mellon will be president, John Stevenson, Jr., and W. H. Donner vice-presidents, and Wm. Flinn chairman of the Board of Directors. The other officers are not yet selected.

Proposed Locomotive Works at Denver.

There have been frequent reports that certain officers of western railroads have been looking for a site in the vicinity of Denver, and it is now said that these men have formed an independent company, with a capital stock of $5,000,000, and will establish a plant in Denver to build locomotives.

Pressed Steel Cars.

Beginning with Dec. 1, and continuing until June 1, the entire product of the Pressed Steel Car Co., over 100 cars a day, will be taken by the Pennsylvania System. This is to fill the order of 15,000 cars for the Pennsylvania.

Cambria and Pennsylvania Steel Companies.

Effingham B. Morris, Chairman of the Cambria and Pennsylvania Steel Companies, in speaking about the business of these companies, said: "The steel business has every indication of continuing good for these companies through the next year. The two companies named will show satisfactory profits this year, and the unfilled orders upon their books are upward of $35,000,000. Both companies are making large expenditures in improvements at the works, and in the purchase of ore and coal lands. It is becoming more and more apparent that only companies who control their own business from the raw material to the finished product can successfully compete with profitable results. These two companies supplement each other in various ways and work together in handling various departments with mutual benefit. Cambria's car shops and agricultural steel departments are also capable of very great development with a continuance of the present profitable results. All of this increased business requires additional capital and makes it imperative to retain a large percentage of the earnings to provide against the well-known contingencies of the steel trade."

Pneumatic Tubes for Chicago.

Bids will be re-advertised for by order of the Postmaster General for pneumatic tube service in Chicago. Jan. 6 will probably be the date for opening the bids.

Clearfield Steel & Iron Co.

Hyde Brothers, Pittsburgh, incorporators of the Clearfield Steel & Iron Company, are making extensive investments in the South, with the intention of centralizing the plants later at Clearfield, Pa. They have bought the plant of the Richmond Iron & Spike Company at Iron Gate, Va. Work will be begun at once in dismantling the plant and the machinery will be removed to Clearfield. Negotiations are pending for the purchase of three other iron works in Virginia and Tennessee. The Clearfield Steel & Iron Company was incorporated about six months ago, and the big works at Clearfield, when completed, will have 24 puddling furnaces, an 18-in. bar mill, a 9-in. guide mill and a 52-in. muck squeezer. A train of rolls for rails up to 30 lbs. will be installed, and a first-class equipment in every way provided. The plant will cost about $300,000.

The Pennsylvania Tunnel at New York.

The New York State Railroad Commissioners, after a hearing at the Fifth Avenue Hotel, New York City, Nov. 24, granted the application of the Pennsylvania, New York & Long Island Railroad Company to construct a tunnel railroad under New York to connect the Pennsylvania and the Long Island railroads. The plans of the company were exhibited and Vice-President Rea said that the location chosen for the terminal station, between Seventh and Ninth avenues and Thirty-third and Thirty-fifth streets, was regarded as the most suitable for all time. About $7,500,000 had been paid for the property. "It is the plan," he said, "to run all through trains from the West to this terminal station for the unloading of passengers, and then proceed to the yards on Long Island, where the trains will be cleaned and prepared for the return trip. The Pennsylvania and the New York, New Haven & Hartford having acquired the New York Connecting Railway, direct connection with New England by way of Long Island City will be established, and the use of floats for passenger traffic done away with. It is not the intention to employ the terminal for freight service at all." The shafts in building the tunnel will be on private property, and the road will maintain all of its present stations on the New Jersey side. It now only remains for the Board of Aldermen to approve the plans.

Damascus Nickel Steel Co.

The Damascus Nickel Steel Company has been incorporated with $1,000,000 capital, to succeed the Nickel Steel & Forge Company, of Pittsburgh. The company is completing an addition to its plant at Carnegie for the manufacture of Damascus and nickel steel, under patents controlled by the National Refined Steel Company. The company also contemplates installing a sheet mill and doubling its melting capacity.

Allis-Chalmers Company Changes.

As a result of a general change in the official management of the Allis-Chalmers Company, Edwin Reynolds, for many years General Superintendent of the Edward P. Allis Company and Chief Engineer of the consolidated company, has been made Consulting Engineer of the entire concern. His nephew, Irving H. Reynolds, General Superintendent, is advanced to the position of Chief Engineer. The position of General Superintendent remains vacant for the present.

Electric Interlocking at Savannah.

The Taylor Signal Company, of Buffalo, N. Y., has equipped with its electric switch and signal apparatus two junctions of the Savannah Union Station Company, of Savannah, Ga. At Georgia Junction there are 14 full-sized semaphores, six dwarf signals and 17 switches and derails. At Florida Junction there are 14 semaphores, two dwarfs and 14 switches and derails. The terminal of the Savannah Union Station Company accommodates the passenger trains of the Atlantic Coast Line, the Southern Railway and the Seaboard Air Line.

THE SCRAP HEAP.

Notes.

Suits have been begun by Attorney George F. Monaghan, of Detroit, as special administrator of the estates of 12 Italian immigrants who were killed on the Wabash Railroad at Seneca in November, 1901, for $50,000 in each case.

At Dallas, Texas, two ticket scalpers have been fined for violating an injunction issued on the occasion of a fair recently held at San Antonio. One of the scalpers was sentenced to $100 fine and 24 hours imprisonment, and the other to $25 fine without imprisonment.

In the United States Circuit Court at Newark, N. J., Nov. 22, the Western Union Telegraph Company secured a temporary injunction restraining the Pennsylvania Railroad from proceeding on Dec. 1 to remove Western Union poles and wires from the railroad right of way. The order is returnable at Trenton, Dec. 8.

The Intercolonial Railway of Canada now has an officer whose title is not announced, but which apparently ought to be "Developer of Agriculture"; his duty being to do what he can in this direction among the farmers in the territory tributary to the railroad. The first incumbent of the office will be Mr. W. W. Hubbard.

The Philadelphia & Reading has filed its answer to the proceeding before the Interstate Commerce Commission begun by W. R. Hearst, alleging a pool among the anthracite coal carrying railroads. The road denies that it is a carrier of coal, as described in the petition, except in respect to a small portion of its traffic, and also denies the charges of unlawful combination or pooling.

The Central of New Jersey has issued a circular, similar to that issued last week by the Reading, notifying its employees that the company will treat them as well, in the matter of pay, as men in the same grades are treated on neighboring roads.

The Chicago & Alton will, on Dec. 1, increase the pay of enginemen, trainmen and switchmen, and according to newspaper reports the advance will average 10 per cent.

The Mexican Government has issued a statement showing the movement of merchandise between this country and that through the railroad gateways at the Rio Grande for four years. It appears that the total movement for this time, southward, was 8,844,000 tons, and northward 2,167,000 tons. The tonnage has decreased considerably during the past two or three years, apparently in consequence of the rapid development of manufacturing in Mexico.

The New York, New Haven & Hartford announces that 500-mile tickets at 2 cents a mile will be sold for use within the State of Connecticut; similar tickets are already sold in Massachusetts. A passenger on the secondary lines of this company living near the boundary between these two states will now be offered three kinds of tickets; first, a ticket at 2 cents a mile, within his own state, if he buys 10 dollars' worth at a time; second, an inter-state rate of 2 cents a mile, provided he buys 20 dollars' worth at a time; third, single-trip tickets at something above 2 cents a mile, usually 2½ cents.

In the City Criminal Court at New Orleans Nov. 19, the "Jim Crow Car law," separating the races in the street cars was found unconstitutional, on the ground that it requires conductors to decide which passengers are white and which colored. The law has been in operation only 15 days, during which time it has given a great deal of trouble and has been repeatedly and openly violated. The case was appealed to the Supreme Court. The white citizens begin to realize the absurdity of the law. When two negroes were arrested because they refused to give up seats which were supposed to be set apart for whites, the white passengers in the car refused to give their names as witnesses. The President, Vice-President and General Manager of the street railway company are under arrest on the charge of violating the law.

New York State Railroad Surgeons.

The 12th annual meeting of the New York State Association of Railway Surgeons was held in New York City Oct. 20. One of the subjects discussed was "The Mental Fitness of Railway Employees," on which there was a paper from Mr. G. R. Brown, Vice-President of the New York & Pennsylvania Railroad. The paper treated of the necessity for a strong mental as well as physical fitness in an applicant for a place on a railroad. Mr. L. L. Gilbert, one of the counsel for the Pennsylvania Lines West of Pittsburgh, compared the relative qualities of American and European railroad men. From his observation in Europe, he said, he believed that in mental and physical fitness the railroad men in this country very much surpassed those in Europe.

Dr. T. D. Mills, a surgeon for the New York, Ontario & Western, spoke of the high standard of the men applying for places on railroads. He said that during the past year he had rejected only two whose minds worked too slowly for the places they sought. The Association elected officers as follows: President, Dr. Henry Flood, Elmira; Vice-President, Dr. J. C. Finn, Hempstead; Secretary, Dr. George Chaffee, Brooklyn; Treasurer, Dr. J. C. Stockwell, Oswego.

Concrete Platforms.

The Chicago & Alton has decided that the wooden platforms around its stations must be abolished in the interests of safety and durability. They will, as rapidly as possible, be replaced by concrete.

Government by Engineer Commissions.

The Mayor of New York has announced the appointment of three engineers to make a report on the sources of water supply for Greater New York in accordance with the request of Commissioner Monroe, of the Water Supply Department. The committee consists of Prof. William H. Burr, Mr. Rudolph Hering, of Manhattan, and Mr. John R. Freeman, of Providence, R. I.

Advances in Freight Rates.

The various reports published concerning the intention of the principal railroads to make advances in freight rates—which, by the way, appear to get into the newspapers before the railroads have finally agreed on the precise increases—may be summarized as follows: Early in December, or about the close of navigation, grain rates from the West to the Atlantic seaboard will be advanced about 2 cents per 100 lbs. (Chicago to New York). Dressed beef and provisions will be advanced 5 cents. An advance of about 2½ cents will be made on grain from the Missouri River to junction points east of the Mississippi, so that the advance through from Missouri River to the Atlantic seaboard will be about 2½ cents. An advance of about 2½ cents will be made from Kansas City to the Gulf of Mexico, the new rate on export grain to Galveston being 17 cents. New York papers say that the railroads have agreed on increases in westbound rates on important commodities, but the commodities are not specified. A meeting has been held at Pittsburgh to consider advances in iron mill products on January 1, the main proposition being to increase rates 20 per cent. A Chicago despatch this week says that the railroads west of that city are trying to agree on the withdrawal of the very numerous special tariffs which have been filed since the issue of the general injunction under which each special rate has been made public; the proposition being to restore to the tariff basis, on Dec. 15, all commodities except packing house products and cattle. In connection with the serious congestion of freight at Pittsburgh, which is mentioned in another column, it is to be noted that the Pennsylvania has placed an embargo on all shipments of cabbages and apples to Pittsburgh, the commission dealers who handle these goods having been slow in unloading.

Train Robbers.

Train No. 11, westbound, on the Chicago, Rock Island & Pacific, the St. Joseph and Kansas City express, was stopped by robbers on the night of Nov. 21 three miles west of Davenport, Iowa. They cut off the express and baggage cars, forced the engineer to run two miles up the track, blew up the through express safe with dynamite, and escaped with their booty. The amount obtained is not known.

A passenger train of the Colorado & Southern was stopped by robbers 12 miles south of Trinidad, Colo., on the night of Nov. 18, and the engineman was compelled to light a fuse by which to blow up the express car with dynamite. The fuse, however, would not burn, and while they were trying to make it work, Express Messenger W. H. Schriber put out the lights in his car, opened the door a couple of inches and shot one of the robbers. The rest then ran away. The wounded man lived a short time, but would answer no questions.

Freight Train Loads.

In our issue of Oct. 24, page 815, appeared an account of some very heavy trains, running up above 4,000 tons, gross. A note from the General Manager of the Bessemer & Lake Erie says: "We have no record of heavy trains to compare with the one mentioned. We are satisfied with an average of 1,750 gross tons of ore, which makes our freight train weight about 2,500 tons of this class of freight, as we have found that it is more economical to divide up than to attempt to handle over 35 or 40 cars per train."

American Labor's Debt to Railroads.

The market for any given product is controlled by that nation which can combine the lowest cost of manufacture with the lowest cost of transportation; and as transportation facilities increase and rates fall, industry thrives, markets widen and wages increase. The above statement is the substance of a long article by Professor Guy M. Walker, which appeared in *Leslie's Weekly*, Oct. 30, 1902. He shows by statistics that the wages received by the workingman bear a close relation (inversely) to the cost of transportation. In Germany, France and England, which approximate each other in the average cost of transportation per ton per mile and in the average mileage per unit of population, there is also a fair agreement in the average wages. While in our own country, where we have the greatest mileage per capita and the lowest cost of transportation, we have the highest average wages to be found in the world. Again, comparison of these same factors by decades for the past 50 years in this country shows that in 1850 the cost of transportation was .035 cents per ton per mile and that the average daily wage was $1.23. In 1900 the cost of moving one ton one mile had decreased to .0069 cents and the wage had increased to $2.60, intermediate periods showing consistent changes. He further states, as his opinion, that the industrial depression in Germany is largely due to the government control of railroads, which condition has abolished competition and maintained freight rates at nearly three times those in America. Every obstacle placed in the way of cheapening the cost of transportation prevents any rise in wages, and it is time that the laboring man should realize that his welfare is inseparably bound up with that of the railroads of his country.

LOCOMOTIVE BUILDING.

The Pere Marquette has ordered four locomotives from the Brooks Works of the American Locomotive Co.

The Pittsburgh & Lake Erie has ordered 25 locomotives from the Pittsburgh Works of the American Locomotive Co.

The Missouri, Kansas & Texas is having 20 locomotives built at the Schenectady Works of the American Locomotive Co.

The Colorado Fuel & Iron Co. has ordered four com-

pound six-wheel saddle tank locomotives from the Baldwin Locomotive Works, for June and October, 1903, delivery. These locomotives will weigh 85,000 lbs., and have 17 x 24 in. cylinders, 44 in. drivers; working steam pressure of 160 lbs.; 161 Shelby seamless drawn steel tubes, 2 in. in diameter, 11 ft. 1½ in. long; fire-box 85⅜ in. long and 34⅜ in. wide; tank capacity, 800 gallons of water. The special equipment includes: Westinghouse air-brakes, Janney couplers, U. S. metallic piston and valve rod packings and Ashcroft steam gages.

The Chesapeake & Ohio, as reported in our issue of Oct. 17, has ordered 25 simple consolidation locomotives from the American Locomotive Co., for December, 1902, and January, 1903, delivery. These locomotives will weigh 186,500 lbs., with 167,500 lbs. on the drivers, and have 22 x 28 in. cylinders, 56 in. drivers; extended wagon top boilers, with a working steam pressure of 200 lbs., and heating surface of 3,070 sq. ft.; 370 charcoal iron tubes, 2 in. in diameter, 14 ft. 9 in. long; wide fire-box 90 in. long and 75 in. wide; grate area, 41 sq. ft.; tank capacity, 6,000 gallons of water and 10 tons of coal. The special equipment will include: Westinghouse air-brakes; open-hearth steel axles; Gollmar bell ringers; Franklin asbestos boiler lagging; Diamond brake-beams; Corning brake-shoes; Janney M. C. B. couplers, with Westinghouse friction draft gear; C. & O. standard headlights; Hancock No. 10 injectors; Ajax phosphor bronze journal bearings; U. S. metallic piston and valve rod packings; Consolidation safety valves; Leach sanding devices; Detroit sight-feed lubricators; Railway Steel Spring Co.'s springs; Latrobe driving and truck wheel tires; cast-iron tender wheels and cast-steel wheel centers.

CAR BUILDING.

The Wisconsin Central is reported in the market for about 500 box cars.

The Intercolonial of Canada is reported to be in the market for 500 box cars.

Hastings Express, Chicago, is having two express cars built by the Pullman Co.

The Illinois Central is having four coaches built at the Barney & Smith Works.

The West Side Belt, Pittsburgh, is having 500 freights built at the Barney & Smith Works.

The Union Petroleum Co. has ordered 25 tank cars from the American Car & Foundry Co.

The St. Clair Terminal is having five freights built at the Detroit Works of the American Car & Foundry Co.

The American Refrigerator Transit Co. has ordered 500 refrigerator cars from the American Car & Foundry Co.

The American Car & Foundry Co. has orders from various parties for 35 cars of different types, and inquiries for 50 additional.

The Canadian Pacific is reported to have ordered 150 stock and 500 flat cars from Rhodes, Curry & Co., in addition to orders recently placed.

The Boston & Maine has ordered 500 American Railway Ass'n standard box cars, 36 ft. long and of 60,000 lbs. capacity, from the Merchants Despatch Transportation Co.

The New York, New Haven & Hartford has ordered 300 flat cars of 60,000 lbs. capacity from the Keith Mfg. Co. They will be equipped with Fox trucks, McCord journal boxes and Star dust guards.

The Weaver Coal & Coke Co., Chicago, has ordered 300 wooden coal cars of 80,000 lbs. capacity from the American Car & Foundry Co., for February, 1903, delivery. Special equipment includes: Steel axles, Commonwealth bolsters, Lappin brake-shoes, National Fulton brasses, Buckeye couplers, Miner draft rigging and A. C. & F. Co. wheels.

The Chicago, Peoria & St. Louis, as reported in our issue of Nov. 7, has ordered 300 wooden coal cars of 80,000 lbs. capacity from the Mt. Vernon Car Works. The special equipment includes: Bettendorf bolsters, Westinghouse air-brakes, Scullin-Gallagher Iron & Steel Co.'s couplers, Miner tandem spring draft rigging, and Mt. Vernon Car Mfg. Co.'s wheels.

The Southern Pacific has ordered 75 refrigerator cars of 80,000 lbs. capacity from the American Car & Foundry Co., for January, 1903, delivery. The cars will be 40 ft. long, built of wood, with wooden underframes. The special equipment includes: Steel axles, Common Sense bolsters, Southern Pacific standard brake-beams, Sargent brake-shoes, Southern Pacific standard trucks and cast wheels.

BRIDGE BUILDING.

Andrews, Ind.—The County Commissioners have appropriated $8,160 for the new bridge over the Wabash here, but the citizens have petitioned for additional appropriations to bring the amount up to $16,000, and to build a bridge for the joint use of the F. W. & S. R. R.

Bloomsburg, Pa.—Borough Council is receiving bids for the erection of a new bridge at Keiter's Mill.

Biltmore, N. C.—The Asheville Street R. R., according to report, proposes to build a bridge across the Swannanoa River opposite the Biltmore Station.

Buffalo, N. Y.—All bridges on the Low Grade Division of the Buffalo & Allegheny Valley line of the Pennsylvania are to be strengthened and, in some cases, rebuilt at an approximate cost of $800,000.

Butler, Mo.—Bids are wanted Dec. 2 by R. E. Johnson for a steel bridge.

Columbia City, Ind.—Bids wanted Dec. 17 for the following steel bridges: No. 1. One 56 ft. 4 panel, upper truss steel bridge, with steel legs and steel backing. No. 2. One 50 ft. 4 panel upper truss steel bridge, with steel legs and steel backing. No. 3. One 42 ft. 3 panel, upper truss steel bridge, with steel legs and steel backing. No. 4. One 24 ft. single panel steel bridge, with steel legs and steel backing. No. 5. One 20 ft. single panel steel bridge with steel legs and steel backing. No. 6. One 18 ft. single panel steel bridge, with steel legs and steel backing. Nos. 7, 8 and 9. Three steel bridges each 14 ft. long, single panel with steel legs and steel backing. Wm. H. Carter, County Auditor.

Council Bluffs, Iowa.—The City Clerk has been ordered to get bids for the Twenty-third street bridge across Myster street. The City Engineer made the plans.

Cumberland, Md.—The Allegany County Commissioners have asked bids for the following steel highway bridges: One Pratt truss over the Georges Creek, at Morrisons, 78 ft. in length; one low Pratt truss over Flintstone Creek, near Gilpen, 50 ft. in length; a 40-ft. bridge over Braddock Run, at Allegany Grove; a 25½-ft. bridge over Bartletts Run, at Barton; two spans over Sideling Hill Creek, between Allegany and Washington Counties, one span, extreme length, 88 ft., and one span beam, extreme length, 25¼ ft. The board also asked bids for a brick and stone arch bridge over Flintstone Creek, at Flintstone.

Dayton, Ohio.—Frank M. Turner, City Civil Engineer, is making plans for the proposed bridges over the Miami at Third street and Stratford avenue. The Third street bridge has already been authorized and will be built first. It will probably not be long before bids are wanted.

Elizabeth, N. J.—The Board of Freeholders has under consideration building a bridge on Irvington avenue. It will probably be a concrete steel structure.

Georgetown, Colo.—Bids are wanted Dec. 30 by H. O. Walker, County Clerk, for a steel bridge over Clear Creek.

Hondo, Medina County, Tex.—The Commissioners' Court has engaged S. A. Oliver, of Houston, Tex., as bridge engineer to supervise the erection of an iron wagon bridge across the Medina River at Castroville. He will make the plans.

Hot Springs, Ark.—The Commissioners of Garland County will soon ask bids for a bridge over the Ouachita River.

Jasper, Ind.—The Board of Commissioners want bids until 1 p.m., Dec. 2, for two iron bridges. Address A. H. Koerner, County Auditor.

Mauston, Wis.—A bridge will be built over Lemonweir River at a cost of $5,000. R. J. Joslyn, City Clerk.

Mendota, Mo.—Bids are wanted Dec. 2 by Geo. W. Dickson at Yuma for a steel bridge.

Milwaukee, Wis.—The Common Council is considering appointing a committee to get the Illinois Steel Co. to pay part of the cost of a bridge across the river to Jones Island.

The city is considering several bond issues, one being $100,000 for a viaduct across the Menomonee Valley at Twenty-seventh street.

The special council committee which has charge of the plan of building a new viaduct at Sixth street across the Menomonee Valley to First avenue has received two propositions from the Milwaukee Electric Railway & Light Company which are regarded with favor by most of the aldermen concerned in the negotiations.

Minneapolis, Minn.—Bids are wanted Dec. 1 at 11 a.m., by the Board of County Commissioners, for three different contracts calling for the rebuilding of certain bridges. Hugh R. Scott, County Auditor.

Mt. Wolf, Pa.—The Pennsylvania R. R. will build a bridge over the Susquehanna River on the proposed new low grade division from Mt. Wolf to the mouth of Codorus Creek, York County, Pa.

New York, N. Y.—Bids are wanted Dec. 11 by the Commissioner of Bridges for building the tower foundation in the Borough of Manhattan for the Manhattan Bridge, formerly known as Bridge No. 3, as advertised in the *Railroad Gazette*.

Philadelphia, Pa.—The Council is considering ordinances to abolish the grade crossings on the line of the Philadelphia & Reading along Ninth street from about Fairmount avenue to Nicetown; also along the Port Richmond branch.

Redding, Cal.—The supervisors have instructed County Surveyor Baltzell to prepare plans and specifications for a steel bridge of the Pratt truss pattern to span Pit River at Elena; also for a steel bridge of the same kind at the crossing of Wyndham Ferry on the Pit River near Baird. The plans will be presented at the January meeting of the Board, when bids will be called for.

Rockford, Ill.—The Board of Supervisors is considering building a bridge across Turtle Creek.

San Francisco, Cal.—The Southern Pacific Co., it is said, is about to undertake the work of eliminating all the crossings at grade on its lines in California.

Scranton, Pa.—It is said the proposed new bridge over Lackawanna River to replace the Race street bridge, will be built at the end of Sanderson avenue.

Victoria, B. C.—The contract for supplying the steel superstructure for the bridge at Point Ellice has been let to the Victoria Machinery Depot Co., Ltd., of Victoria, at 6¼ cents per pound for all steel. The other bidders on this work were King Bridge Co., Cleveland, Ohio; Canadian Bridge Co., Walkerville, Ont.; Heenan & Froude, Manchester, Eng.; Dominion Bridge Co., Montreal, Que., and the Puget Sound Bridge & Dredging Co., Seattle, Wash.

Wheeling, W. Va.—Bids are wanted until Dec. 12 for furnishing some trestles for dam No. 5, Kanawha River. Address W. F. Craighill, Superintendent of Engineers, U. S. A., at Wheeling.

Wilmington, Del.—It is said that the Levy Court has decided to build a bridge across Christiana River near Newark. It is also said that the plans are made.

Windsor Locks, Conn.—An officer of the New York, New Haven & Hartford writes that no decision has yet been arrived at in regard to rebuilding the bridge at Windsor Locks.

Other Structures.

Allegheny, Pa.—The Rosedale Foundry & Machine Co. proposes to build a steel foundry, machine shop and office building at Washington and Preble avenues.

Birdsboro, Pa.—The Diamond Drill & Machine Co. is about finishing a large steel plant here. The work has been under way for over a year. The main steel foundry building is 360 ft. long with side buildings 220 by 250 and 250 by 300 ft.; an iron foundry 106 by 250 ft., and machine shops 80 by 175 and 40 by 80 ft. All the machinery will be run by electricity.

Birmingham, Ala.—The Republic Iron & Steel Co. will rebuild its machine shop at Birmingham which was recently burned. The new plant will need an entire new equipment of machinery.

The Southern Ry. has completed negotiations for a number of acres of land at North Birmingham upon which it will build shops.

Bowling Green, Ohio.—The Toledo & Ohio Central is receiving bids at Toledo for the new station which will be built at Bowling Green.

Cincinnati, Ohio.—It is said the Cincinnati Southern Ry. is considering building a new station in the vicinity of Western avenue and Bank street.

Colorado City, Colo.—The Colorado Steel Casting Co. has been incorporated, with $500,000 capital, to make railroad castings. The plant will be built in Colorado City and the incorporators are John I. Franklin, C. F. Vanetta, F. J. Hobbs and others.

Elizabeth, N. J.—The A. & F. Brown Progress Iron Co., which has a large plant at Elizabethport, will greatly enlarge this plant, and has recently secured permission from the city to close certain streets.

Fayetteville, Ark.—The University of Arkansas is having plans made to rebuild Machinery Hall, which was destroyed by fire last month. The Professor of Mechanical Engineering will be glad to receive catalogues from dealers in machine tools and other supplies. His address is Fayetteville. The new building will cost $50,000.

Irwin, Pa.—The Hockensmith Wheel & Mine Car Co. writes that work has been begun on its plant at Penn Station, four miles from Irwin. The works will consist of structural steel and brick construction, and the buildings include a foundry and machine shop, 225 x 60 ft.; blacksmith and car erecting shop, 175 x 50 ft.; pattern shop, 125 x 25 ft., two stories, and power house, 50 x 50 ft. Electric power is to be used throughout. The approximate cost will be $100,000.

Martinsburg, Pa.—The Pennsylvania will build a new station here.

Memphis, Tenn.—Local reports state that a car and foundry company is being formed with local capital only to make all kinds of freight cars in Memphis.

Mobile, Ala.—The Mobile Railway Terminal Co. has been organized by Samuel Spencer, A. B. Andrews, W. W. Finley, E. L. Russell and others, of the Southern, and proposes to build a modern passenger station at a cost of about $500,000 in Mobile. Mr. Russell is President of the company.

Montreal, Que.—The contract for the blacksmith shops of the new car works at Hochelaga for the Canadian Pacific has been let to Lessard & Harris, of Montreal. The building, which is the eighth for which contracts have been let, will be 630 ft. long and 130 ft. wide. There will be an annex for large forges which will serve for both car and locomotive work. Altogether 17 buildings will be put up.

New Castle, Pa.—The Pittsburgh & Lake Erie, it is reported, will build a new passenger station at a cost of about $100,000.

New Castle Junction, Pa.—The plans have been made for the machine shop, repair shop and roundhouse for the Baltimore & Ohio at New Castle Junction. The machine shop will be 200 x 60 ft. The storehouse and repair shop will be much smaller in dimensions. The roundhouse will have a radius of 190 ft. and will house 40 locomotives. Paul Didier, Assistant Chief Engineer, will be in charge of the work.

Parkersburg, W. Va.—An officer of the Baltimore & Ohio is reported as saying that the shops at Parkersburg will be greatly enlarged and a large amount of money spent in putting them in condition to do all heavy work for the four divisions centering at Parkersburg.

Pittsburgh, Pa.—The Pressed Steel Car Co. has let a contract to A. M. Eikie & Co. for a large office building in McKees Rocks, at a cost of $100,000. In this building will be consolidated all the clerical force.

Portland, Me.—The Portland Iron & Steel Co. is considering getting bids on rebuilding its plant which was destroyed by fire.

San Francisco, Cal.—Despatches state that fire on Nov. 20 destroyed the Southern Pacific station, freight depot and ferry slip at the end of the Alameda Mole causing a loss of about $500,000.

Tonawanda, N. Y.—It is said that representatives of H. C. Frick have been buying land near here upon which it is proposed to build a steel plant.

Wilmington, Del.—The Wilmington Malleable Iron Co. has bought some land adioining the Lobdell Car Wheel Co., and will build a new and larger malleable iron plant there. The present site is said to have been sold to the Hilles & Jones Co., which has large shops in the immediate vicinity.

Windsor Locks, Conn.—The plant of the E. Horton & Son Co. will probably be doubled in size.

York, Pa.—The Norway Iron & Steel Co. proposes to increase its capital stock from $300,000 to $1,000,000. It has already adopted plans for extensive improvements.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Railway Club of Pittsburgh.

The regular meeting of this club will be held at Hotel Henry, Pittsburgh, at 2 p.m., Friday, Nov. 28. The subject for discussion will be the paper presented by Mr. C. V. Slocum, "The Chilled Iron Car Wheel."

The Rocky Mountain Railway Club.

At the regular monthly meeting of the Rocky Mountain Railway Club held on Saturday, Nov. 22, at 7:30 p.m., in the Assembly room, second floor, Union Depot, Denver, the subject was "Locomotive Lubrication." (Paper on this subject, by Mr. F. P. Roesch, Traveling Engineer, Colorado & Southern Railway, was published with the October proceedings.)

The Engineers' Club of Philadelphia.

The twenty-fifth anniversary of the club will be celebrated by a banquet, to be held at the Union League, on the evening of Saturday, Dec. 6, at 6:30 o'clock. Some of the most eminent and prominent engineers of the country will be present as guests and speakers, and in all its appointments the banquet will be one worthy of the important event which it celebrates.

New York Railroad Club.

At the election on the 21st the following officers were chosen: President, H. H. Vreeland; First Vice-President, W. W. Wheatly; Second Vice-President, A. M. Waitt; Third Vice-President, W. F. Potter; Treasurer, C. A. Smith; Secretary, W. B. Yereance; Executive Members, G. W. West, W. McIntosh, H. S. Hayward; Finance Committee, W. B. Albright, D. M. Brady, R. M. Dixon.

Western Railway Club.

It is intended to make the December meeting of the club one of unusual interest. Dr. Herman von Schrenk, who has charge of the Mississippi Valley Laboratory of the Bureau of Plant Industry, U. S. Department of Agriculture, will give a lecture on "Timber Preservation," which will be illustrated by stereopticon views and also a number of specimens. Mr. J. D. McPartland, Assistant Superintendent of the Chicago, Burlington & Quincy, Burlington, Iowa, will have a paper on "Average Freight Car Lading and Tons Lading of Freight Trains." Mr. J. P. Murphy, General Storekeeper of the Lake Shore & Michigan Southern, Collinwood, Ohio, will present a paper on "The Supply Car."

The Franklin Institute.

The programme of papers includes:

Wednesday, Nov. 19.—"The Storage and Transporta-

tion of Acetylene." John S. Seymour, Esq., of New York.

Mr. Seymour will present, for the first time before a technical society, the details of an invention of radical importance in connection with the utilization of acetylene for public and private illumination. The novelty of the system, and its apparently ideal solution of the acetylene problem, should claim the attention of all members of the Institute who are directly or indirectly interested.

Thursday, Nov. 20.—"Metallography." Mr. Albert Sauveur, Boston Testing Laboratory.

Thursday, Dec. 4.—"Pulverized Fuel." Mr. C. A. Rudolph, Philadelphia.

Friday, Nov. 21.—"Two Years in Argentina as Consulting Engineer to the Ministry of Public Works." Mr. E. L. Corthell, C. E.

American Association for the Advancement of Science.

The general provisional programme for the meeting of this Association at Washington, D. C., from Dec. 27 to Jan. 3 next, provides for a meeting of the Executive Committee of the Council at the Cosmos Club on Saturday, Dec. 27. The first general session of the Association will be held at 10 a.m. on Monday, Dec. 29, in the Lafayette Theatre, and will be called to order by Prof. Asaph Hall, U. S. N., the retiring President, who will introduce Dr. Ira Remsen, President-elect. There will be an address of welcome; a reply by President Remsen; announcements by the general, permanent and local secretaries, and the adjournment of the general session, followed by the meeting and organization of the different sections at their respective halls, and addresses to each section by the Vice-Presidents of the Association. The annual address of the retiring President will be delivered on Monday, Dec. 29, at 8 p.m. During the succeeding days of the meeting the Council will meet each day at 9 a.m., a short general session of the Association will be held at 10 a.m., and the different sections will meet each day immediately after the adjournment of the general session until 1 p.m., and after one hour's intermission for luncheon will meet again from 2 to 5 p.m. A public lecture will be given on Thursday evening, Jan. 1, at 8 p.m., on the subject of "Volcanoes of the West Indies," to be followed by the election of officers and the selection of the place of the next meeting.

American Society of Mechanical Engineers.

The 46th meeting will be held in New York Dec. 2 to 5. On Tuesday, Dec. 2, the convention will be opened at 8:30 p.m., at the Society's parlors. As the President of the Society, Mr. Edwin H. Reynolds, is ill and not able to be present, paper No. 0959, by Sidney A. Reeve, on "A Rational Solution of the Problem of Weights and Measures," will be taken up for discussion.

The second session on Wednesday morning, Dec. 3, at 10 o'clock, will be held in the Sturtevant House, Broadway and 29th street, being the business session of the annual meeting. The action on the proposed amendments to the rules will be taken. Until the hour of adjournment after the executive business has been concluded professional papers will be taken up as follows: No. 0956, F. A. Halsey, "The Metric System"; No. 0962, S. A. Reeve, "Entropy Analysis of the Otto Cycle." A luncheon will be served from 11:45 to 2:30.

Wednesday afternoon and Friday afternoon are left without definite assignment.

The third session on Wednesday evening, 8:15 p.m., will be a professional session at the Sturtevant House. Papers will be taken up as follows: No. 0971, J. C. Riley, "Apparatus for Obtaining a Continuous Record of the Position of an Engine Governor"; No. 0967, W. I. Slichter, "Fly Wheel Capacity for Engine-Driven Alternators": No. 0955, Wm. Kent, "Heat Resistance the Reciprocal of Heat Conductivity"; No. 0954, Topical Discussions: No. 147, Smoke Consumption; No. 148, Elastic Resistance; No. 149, Oil Burners; No. 150, Oil Separation from Steam; No. 154, Oil-Tempering of Steel.

The fourth session on Thursday morning, 10 a.m., will also be a professional session at the Sturtevant House. Papers will be taken up as follows: No. 0968, J. M. Barnay, "A Forty-four-Foot Pit Lathe"; No. 0964, Chas. T. Porter, "Finer Screw Threads"; No. 0969, C. C. Tyler, "A Surveying Instrument in the Machine Shop"; No. 0966, Frank Richards, "Gift Propositions for Paying Workmen"; No. 0961, W. Trinks, "Deflections of Beams by Graphics." This session will adjourn promptly at 12:45 to allow time for luncheon and to allow for visits to power stations.

For Thursday afternoon it has been arranged that the stations of the Interurban Street Railway Co., at 93d street; the Manhattan Elevated Railway Co., at 74th street, and the Waterside Station of the New York Edison Co., at 38th street, shall be open to members, and the numbered badge will be sufficient to secure admission. The Interurban Street Railway Company has offered to furnish free transportation for members and guests to and between stations for this afternoon, details concerning which will be furnished at the meeting.

On Thursday evening there will be a reception and conversazione at Sherry's, 44th street and Fifth avenue.

The closing session on Friday morning, at 10:30 o'clock, will be at the Society House. Professional papers as follows: No. 0970, J. T. Wilkin, "Rotary Pumps"; No. 0965, H. M. Lane, "Filing System for Office Use"; No. 0963, A. F. Nagle, "Analysis of Commercial Value of Water Power, per Horse Power per Annum"; No. 0972, B. Viola, "Centrifugal Machines"; No. 0973, A. Kingsbury, "Oil-Testing Machine and Results." Concluding business. Adjournment.

PERSONAL.

—Mr. C. W. Tait, Acting Division Master Mechanic of the Gulf, Colorado & Santa Fe Railway, was shot and killed on Nov. 17, while superintending a wreck on one of the divisions.

—Sir William C. Roberts-Austen, Past-President of the Iron and Steel Institute and Honorary General Secretary of the British Association for the Advancement of Science, died in England Nov. 23. He was born in 1843.

—Mr. Charles M. Muchnic, recently Mechanical Engineer of the Denver & Rio Grande, has been elected Secretary to the Second Vice-President of the American Locomotive Company. Mr. Muchnic will be located at Dunkirk, N. Y.

—About the first of October Mr. George Collins became Receiver and Manager for the Central Ontario. Mr. Collins was born July 20, 1860, and started his railroad service with the Central Ontario in 1882 as a clerk on construction, and has been continuously with this company passing through the various positions of Agent, Train Despatcher, Secretary and Treasurer, General Superintendent and Secretary, finally becoming the Receiver and Manager.

—The Corporation Commission of Virginia, which has extensive powers over all chartered corporations of that State, including railroads and steamer lines, and which supersedes the railroad commission, is to be composed of Messrs. B. T. Crump, H. Fairfax and H. C. Stuart. Mr. Crump is a lawyer, Mr. Fairfax a railroad man, and Mr. Stuart is a farmer. Their terms expire in February, 1904, 1906, and 1908, respectively, and their salaries are to be $4,000 a year, each.

—Mr. H. K. Mudd, the new Master Mechanic of the Cincinnati, Richmond & Muncie, was born in Grafton, W. Va., in 1873, and was graduated from Purdue University in 1896. During his college course Mr. Mudd also worked as a machinist apprentice in the Pennsylvania shops at Ft. Wayne. After graduating he went to Springfield, where he entered the service of the Wabash as a machinist. In February, 1902, he was sent to Decatur, where he was Assistant Master Mechanic, from which position he has just resigned to go with the Cincinnati, Richmond & Muncie as above.

—Mr. C. O. Tilton, Signal Engineer of the Chicago, Milwaukee & St. Paul at West Milwaukee, Wis., who had been severely ill for several months, died on Nov. 11. Although Mr. Tilton had been in a hospital for some time, his death was quite unexpected, and indeed occurred at the very hour when his friends in the meeting of the Railway Signaling Club at Pittsburgh were voting to send him a message of sympathy. Mr. Tilton had been Secretary of the Railway Signaling Club for several years, and had thus become known throughout the country. His friends were as numerous as his acquaintances, for his amiable disposition had endeared him to all who knew him.

—Mr. Joseph M. Wilson died suddenly in his office in Philadelphia on Nov. 24. Mr. Wilson was highly distinguished as an engineer and an architect and was closely identified with the business and social life of Philadelphia. He was a son of Mr. William Hasell Wilson, who died last August in his 91st year, and of whose remarkable career we gave considerable account at that time. Joseph Miller Wilson was born at Phœnixville, Pa., June 20, 1838, and was graduated from the Rensselaer Polytechnic Institute in 1858. Afterwards he studied chemistry in Philadelphia, and in 1860 became an Assistant Engineer on the Pennsylvania Railroad. He served until 1886 as Resident Division Engineer and as Principal Assistant Engineer on that road. Since 1876 he has also been in private practice as a member, and lately as the head of, the firm of Wilson Brothers & Company, engineers and architects, in Philadelphia. This firm has designed many railroad bridges, stations, shops and other buildings besides some famous business buildings. We believe that Mr. Wilson would have given greatest importance to three of the buildings designed by his house; namely, the Reading Terminal, in Philadelphia; the Drexel Institute, in West Philadelphia, and the Drexel Building at Fifth and Chestnut streets, Philadelphia. The firm has a large practice outside of Philadelphia, and has made many studies for hospitals, prisons and other public buildings. Mr. Wilson was frequently called on for consultation in a variety of engineering work of importance in various parts of the country, for his sagacity and public spirit were widely recognized. He was a member of the American Society of Civil Engineers and served a term as Director in 1888 and as Vice-President in 1894 and 1895. He had served as President of the Franklin Institute and was a member of the Institution of Civil Engineers (England), the Engineers' Club of Philadelphia, and the American Philosophical Society, a Fellow of the American Association for the Advancement of Science, and a Fellow of the American Institute of Architects and other public bodies. He was a member of the Century Club in New York.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—The following elections have been made: First Vice-President, Alexander Hamilton; Second Vice-President, C. S. Gadsden; Third Vice-President, T. M. Emerson, formerly Traffic Manager. A new office—Fourth Vice-President—was created, and J. R. Kenly, General Manager, will hold both offices. Herbert L. Borden was made Secretary and Jas. F. Post was elected Treasurer.

Baltimore & Ohio.—E. T. Horn, heretofore Manager's Assistant of the Intercolonial, has been appointed Assistant to the General Superintendent of the B. & O., with headquarters at Pittsburgh. John Dalman has been appointed Master Mechanic, with headquarters at Newark, Ohio, succeeding H. N. Breneman, effective Dec. 1. E. Kennerdell, Master Mechanic, has been transferred from Lorain to Cleveland as General Foreman, and C. B. Cramer has been transferred from Cleveland to Lorain as General Foreman. S. P. Hutchinson, Division Superintendent at Pittsburgh, Pa., has resigned. (See Michigan Central.)

Chicago, Milwaukee & St. Paul.—C. H. Scott, Division Superintendent, with headquarters at Aberdeen, S. Dak., has resigned.

Chicago, Rock Island & Pacific.—K. E. Palmer has been appointed New England Passenger Agent, with headquarters at Boston, Mass., succeeding the late Mr. Loomis.

Chicago Union Transfer.—Ralph Isham, Secretary, has been elected Treasurer, succeeding C. W. Hillard, resigned. James A. Lozier has been appointed Auditor, with headquarters at Chicago, Ill.

Denver & Rio Grande.—F. C. Borst has been appointed Mechanical Engineer, with headquarters at Denver, succeeding Charles M. Muchnic, resigned to go with the American Locomotive Company.

Eastern Texas.—E. H. Payne has been appointed Auditor and Treasurer, succeeding W. V. Bolman, resigned to accept service elsewhere.

Great Northern.—A. E. Long will succeed B. F. Egan, Superintendent of the Kalispell Division, as Acting Division Superintendent, and S. A. Walker, Assistant Superintendent, will be Acting Superintendent of the Montana Division.

Kansas City, St. Joseph & Council Bluffs.—J. W. Mulhern has been appointed Superintendent of Terminal, with headquarters at Kansas City, Mo., succeeding E. G. Fish, resigned.

Lake Erie, Alliance & Wheeling.—F. Gleich has been appointed Foreman of the Car Department, with headquarters at Alliance, Ohio.

Lexington & Eastern.—A. Cary has been elected President, succeeding R. E. Todd, resigned.

Michigan Central.—S. P. Hutchinson, heretofore Division Superintendent of the Baltimore & Ohio, has been appointed Assistant General Superintendent of the M. C., with headquarters at Detroit, Mich.

H. D. Miles, Assistant Division Superintendent, with headquarters at Jackson, Mich., has resigned.

Missouri, Kansas & Texas of Texas.—C. T. McElvaney has been appointed Master Mechanic, with headquarters at Denison, Texas, succeeding A. C. Loucks, resigned.

St. Louis, Watkins & Gulf.—D. Jacobs has been appointed General Freight and Passenger Agent, with headquarters at Lake Charles, La., succeeding C. F. Crockett, resigned.

Seaboard Air Line.—E. F. Cost, heretofore Freight Traffic Manager of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed Traffic Manager of the S. A. L., with headquarters at Portsmouth, Va.

Tennessee Central.—G. Bottinger, Chief Engineer, with headquarters at Nashville, Tenn., has resigned, effective Jan. 1.

Western Maryland.—B. H. Griswold, heretofore General Freight and Passenger Agent, has been appointed General Traffic Manager. H. B. Henson has been appointed Comptroller; L. F. Tillerman, Secretary, and J. T. Barnes, Treasurer.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ARKANSAS NORTHERN.—This line is projected from a point near the Southern Missouri line south through Randolph, Lawrence, Independence and Jackson Counties, Ark., reaching Pocahontas, Powhatan, Jacksonport, and other places, a total of about 100 miles. J. H. Myers may be addressed at Black Rock, Ark.

ARKANSAS, RED RIVER & PARIS.—This company filed articles of incorporation in Arkansas Nov. 14, and charter was granted by the State Board. W. A. Carroll, of Mena, Ark., may be addressed.

AUGUSTA-WATERVILLE (ELECTRIC).—Press reports state that two new electric lines will be built during the coming year between these points in Maine, one on either side of the Kennebec River. A large amount of other electric railroad building is to be done in adjacent portions of the State.

BAY OF QUINTE.—An officer writes that contracts are to be let in the near future for a line from Tweed, Ont., to Bannockburn, 20 miles, by way of Actinolite and Queensboro. Ultimate extension from Bannockburn to North Bay, 175 miles, is projected. During the year six miles of main line have been built. (Sept. 5, p. 695.)

BLACKSTONE & SOUTHERN.—This company, which has been formed to build a railroad 15 miles long from Blackstone, Va., to a connection with the Seaboard Air Line at McKinney, has been voted a subscription unanimously by the town of Blackstone. Preliminary surveys were begun early in November. H. H. Seay, of Blackstone, is interested.

BOSTON & WORCESTER STREET.—The Massachusetts Railroad Commissioners on Nov. 10 authorized an issue of $750,000 capital stock, which is the entire amount of capital stock of the company, and the first issue which has been authorized. It is said that all of it has been subscribed for. Locations have been made along the route paralleling the Boston & Albany between the points named, a distance of 44 miles, and the general contract was let last December to J. F. Shaw & Co. The new road was defeated by the Boston Elevated in its efforts to obtain a right of way into Brookline, and will be obliged to make a traffic arrangement with the elevated road in order to enter Boston.

CANADIAN NORTHERN.—According to most recent advices, track will be laid this year on the Erwood-Prince Albert extension as far as Dogwood, which is 45 miles west of Erwood. Location surveys for the extension, which will be approximately 180 miles long, were made about a year ago. The country is flat and the work is easy, but has been delayed by scarcity of labor. (Dec. 6, 1901, p. 849.)

CANADIAN PACIFIC.—Tenders have been asked for grading the yards at Frank, in the Province of Alberta. The work as planned calls for the building of a four-track roadbed one mile long, and a number of side tracks totaling about 10 miles of new line.

CENTRAL KANSAS INTERURBAN.—Surveys are reported for an electric line from McPherson, Kan., to Wichita, a distance of about 60 miles, with the ultimate prospect of further extension to Arkansas City. Rights of way for a portion of the distance have been secured. The company has in prospect also a number of other lines in the central part of Kansas.

CHICAGO & NORTH WESTERN.—An officer writes that the property recently secured for a new line from Choate, Mich., through Ewen, to a connection with the Copper Range at Mass City, is not in the interest of the above.

CENTRAL OKLAHOMA UNION DEPOT & TERMINAL R. R.—Incorporation has been granted this company in Oklahoma to build terminals for railroads entering Guthrie and Oklahoma City, and also to build belt lines, and 150 miles of additional railroad in Oklahoma. J. J. Collister, J. G. Trimble and others, of Kansas City, are interested.

CHICAGO JUNCTION.—The Secretary of State of Illinois has licensed incorporation of this company, which proposes to build within the limits of Chicago, to a point in connection with the South Side Elevated, and other Chicago railroads. It is understood that the purpose of the new road is to build a belt line connecting with the various elevated and steam railroads centering in various portions of Chicago. The incorporators are Frederick R. Babcock, Wm. Raymond, James Miles and others, of Chicago.

CHICAGO, ROCK ISLAND & PACIFIC.—It is said that the new road to be built from Versailles, Mo., to Kansas City, has now been located from Windsor westward through Leeton to Henry County, paralleling for a portion of the distance the Missouri, Kansas & Texas. Contract to grade from Versailles to the Big Blue River at Kansas City, 125 miles, was let last September to the W. R. Stubbs Co. (Oct. 3, p. 765.)

CINCINNATI & LOUISVILLE.—This company filed articles of incorporation in Indiana Nov. 15, with the intention of building from a point on the Cincinnati & Indiana Western R. R., and the Miami River in Hamilton County, Ohio, eight miles from Cincinnati, to Louisville. A number of officers of the Cincinnati, Richmond & Muncie are included in the directorate of the new line, Wm. R. Bradford, H. L. Jackson and J. S. Graves being among them.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—Press reports state that the directors have approved a 50-mile cut-off from Hillsboro, Ill., to Mitchell, just outside of St. Louis, and it is understood that trackage rights will be granted to the St. Louis & San Francisco for a period of years, between St. Louis and Paris.

COLUMBIAN R. R. (ELECTRIC).—This company was incorporated in Ohio Nov. 13, to build from East Liverpool to Salem, by way of Lisbon, a distance of 23 miles.

Former Secretary of State D. J. Ryan, of Columbus; H. R. Young, of Cleveland, and others are interested.

Donora-Elk Creek Harbor.—The Union Steel Co., formed at Pittsburgh Nov. 20 as a consolidation of the Mellon and Sharon steel interests, will, it is said, build a railroad from Donora, Pa., to Elk Creek Harbor, by way of South Sharon. Elk Creek Harbor is 15 miles west of Erie.

England & Clear Lake.—This company has been incorporated in Arkansas to build a railroad about nine miles long, from a point in Lonoke County, to Laster's Landing, on the Arkansas River. J. E. Hicks, N. B. Beakley and others may be addressed at Little Rock.

Grand Rapids, Charlotte, Battle Creek & Lansing (Electric).—A company has been organized in Michigan to build an electric road about 90 miles long, between the points named. It is one of a large number of organizations which have been effected within the past year to build a series of long distance electric routes out of Grand Rapids. Wm. A. Smith, Thomas Hefferan, Chas. B. Helsey and others, of Grand Rapids, are interested.

Grand Trunk Pacific.—An officer of the Grand Trunk is quoted as saying that his company proposes to build a second trans-continental line through Canada under the above title, involving between 2,500 and 3,000 miles of line. The projected route runs through northern Ontario, Manitoba, Saskatchewan, Assiniboia and Alberta; through the Peace River or Pine River Pass and British Columbia to a terminus on the north Pacific Coast. It is intended that this line shall be built with low grades, steel bridges and heavy rails. The New York office has received no pamphlet in regard to this proposed line, but understands that the facts, as cited above, are correct.

Hartford & Middletown (Electric).—This company is making surveys for an electric line from Hartford to Middletown, 17 miles, paralleling the New York, New Haven & Hartford.

Havana Electric.—It is said that the Insular Railway Co., whose stock is controlled by the above, has secured franchises for an electric line in the vicinity of Havana which will approximate 100 miles. It will be independent from the Havana & Jaimanitas Co.

Indianapolis, Greenwood & Franklin Interurban.—Work is reported in rapid progress on this electric line in Indiana which is being extended to Columbus, about 45 miles from Indianapolis, by way of Greenwood and Franklin. The work is heavy and is being done in a substantial manner on private right of way. The projected route parallels the Pennsylvania.

International & Great Northern.—The extension from Waco to Fort Worth, Texas, 100 miles, has been completed. Hugh Burns, of Taylor, Texas, was the general contractor. (Jan. 3, p. 14.)

Jackson & Battle Creek Traction.—This company, which was incorporated last May to build an electric line 42 miles long paralleling the Michigan Central between Jackson and Battle Creek, Mich., has filed a mortgage to the Savings & Trust Co. of Cleveland, trustee, to secure $1,200,000 5 per cent. gold bonds, dated Nov. 3, 1902, and due Jan. 1, 1923, subject to call at 103. It is announced in the advertisement that an effort will be made to complete the line by Jan. 1, 1903. It will be worked by third-rail, on private right of way, except through the towns and cities. The authorized and outstanding stock has recently been increased from $900,000 to $1,500,000, all of one class. C. M. Spitzer, of Toledo, is President. (May 30, p. 404.)

James Bay.—Five and one-half miles of this new line from Parry Sound to a junction with the Canada Atlantic have been completed.

Kentucky & West Virginia.—Surveys are reported for this projected line from Ashland, Ky., up the Rockcastle Valley to Inez, in Martin County, 47 miles, passing through the Elkhorn coal region. It is understood that the railroad company has offered to build the road if the rights of way will be given by property holders, and agrees to have the line completed within three years from date of contract.

Long Island.—Surveys are reported for a double track on the Oyster Bay Division between Roslyn and Oyster Bay, 10 miles. The traffic on this section is heavy in the summer months.

Louisville & Nashville.—Press reports say that surveys have been begun for the proposed changes of grade and curvature which are to be made on the Atlanta, Knoxville & Northern, at an estimated cost of $1,000,000. The contemplated improvements will be chiefly between Ducktown, Tenn., and Marietta, Ga. (Oct. 3, p. 766.)

Mobile, Jackson & Kansas City.—According to most recent advices this line has now been completed from Mobile to Hattiesburg, Miss., a distance of 97 miles. When the November time-table was issued several weeks ago, trains were being run between Mobile and Merrill, 50 miles. It is understood that the line is entirely independent. F. B. Merrill, Frascati (Mobile), Ala., is President and General Manager.

Montana R. R.—Work has been begun by a considerable force on this new line between Harlowton and Lewistown, Mont. The Utah Construction Co. is the chief contractor. (Oct. 31, p. 846.)

Nashville, Chattanooga & St. Louis.—Propositions have been made to President Thomas by citizens of Lynchburg and Tullahoma, Tenn., for a branch road between these points which are 12 miles distant. If feasible, the plan will be brought before the directors.

Newton & Northwestern.—An officer writes that this company, which is the successor of the former Boone, Rockwell City & Northwestern Co., has 19 miles of road now building between Gowrie and Rockwell City, Iowa, and seven miles between Fraser and Boone, Iowa, under contract to Henry F. Balch, of Boone, Iowa. Surveys have been made also from Boone to Newton, 54 miles additional. Hamilton Browne, of Boone, Iowa, is President. (Oct. 17, p. 806.)

New York & Brooklyn.—This company, which is the holder of a franchise granted in 1896 for a tunnel from Ann street and Park Row under Nassau, William and other streets to Pier 23, and thence to City Hall, Brooklyn, is making preliminary borings on property owned by it at the corner of Water and Beekman streets.

New York Central & Hudson River.—Grading is reported begun on an extension of the Pennsylvania Division from Burnside to Cherry Tree, Indiana County, Pa., a distance of seven miles. The road will follow the west bank of the Susquehanna River and connect with the Pennsylvania at Cherry Tree, and is to be built by June, 1903.

Northern Pacific.—Surveys are reported for an extension from Kalama, Wash., down the north bank of the Columbia River to the Pacific ocean, opposite Astoria, paralleling the Portland & Astoria line, which runs along the south bank of the Columbia. The distance is about 70 miles and the projected line, if built, will give the Northern Pacific an independent ocean outlet for its ore traffic.

It is said that a line will also be built next year from some point on the Columbia, to the Yakima Valley in the central part of the State of Washington, through Cispus Pass. Such a line would be from 50 to 60 miles long.

Orange & Southwestern.—It is said the directors have ordered surveys made for an extension from Buna to Shreveport, La., about 135 miles. These will be in charge of H. L. Montandon. An amendment to the company's charter was filed last June providing for a number of extensions. (June 27, p. 520.)

Oregon Water Power & Ry.—Grading is reported begun on the projected line from Gresham to Clackamas Falls, near Springwater, Ore., a distance of 20 miles. It is said that track laying will be begun within a few days on the section already graded between Gresham and Lents. This line will be worked by electricity which is to be generated by water power at the falls. Winters, Parsons & Boomer are the contractors.

Pennsylvania, Monongahela & Southern.—An officer writes that it is not known at the present time when contracts for this projected line will be let. (Nov. 14, p. 882.)

Pennsylvania.—An officer denies that an extension is to be built from Tiffin to Marion, Ohio, for the Lines West.

Philadelphia & Reading.—There has recently been considerable agitation in Philadelphia for elevation of the Reading's tracks on account of the large number of casualties which have occurred at the grade crossings. It is now understood that plans have been made for a joint removal of the crossings by the city and the railroad company. Details of the plan are not available at the present time.

Philadelphia Roads.—A resolution has been adopted by both branches of the City Council asking that the finance committee authorize a loan of $8,500,000 to abolish grade crossings throughout the city.

Philippine Roads.—The English syndicate which operates the line between Manila and Dagupan, has applied for a franchise to build from Guiguinto, in the Province of Bulucan, to Cabantuan, in Nueva Ecija Province, with the intention of ultimately extending further to Apprion, on the north coast of Luzon.

Piggott & Northwestern.—Charter has been granted this company in Arkansas to build a line 12 miles long from Piggott, on the St. Louis Southwestern, to a point in Clay County. F. G. Taylor, J. M. Meyers and others are directors, and may be addressed at Little Rock.

Pittsburgh Elevated Railroads.—Charters have been issued to the Second Avenue and the Bloomfield Elevated railroads which propose to build an elevated line between six and seven miles long within the city of Pittsburgh. The incorporators of the two companies are identical.

Porto Rico Roads (Electric).—Franchises have been granted to Philadelphia interests to build an electric system in Porto Rico which is designed to connect Ponce and San Juan. Wm. Yeager, of the Vandergrift Construction Co., Philadelphia, may be addressed.

St. Louis & San Francisco.—According to most recent advices, the new line from Brownwood to Brady, Texas, 49 miles, will probably be completed by the first of next year. At present about 15 miles of track have been let. (June 6, p. 422.)

Surveys are reported for a cut-off from Dillon, Mo., which will run through Rolla and strike the main line at some point not yet determined, for the purpose of avoiding several hills at Dillon, Rolla and Dixon, and to shorten the route between St. Louis and Springfield.

Sligo & Eastern.—It is said that 18 miles of this projected line, which is to develop lumber lands owned by the Sligo Iron Co., have been located. Charter for 12 miles from Sligo, in Dent County, Mo., to Dillard, in Crawford County, was granted in August. A. B. Shepley and others, of St. Louis, are the contractors. (Aug. 22, p. 664.)

Syracuse & Ontario.—This company was organized in Syracuse Nov. 17, to build from Syracuse to Oswego, N. Y., through Baldwinsville, West Phœnix, Fulton and Minetto. The distance is about 35 miles and the projected line would parallel the New York Central & Hudson River and the Delaware, Lackawanna & Western. Chas. M. Warner, of Syracuse, is President, and W. B. Rockwell is General Manager and Chief Engineer.

Tallahassee-Tampa.—The J. P. Williams Co., of Savannah, Ga., dealers in cotton and naval stores, are interested in a project to build a new railroad between the points named in Florida. Such a line would be about 250 miles long.

Terminal Railroad Association of St. Louis.—It is said that bids will be asked by this company for extensions of its terminal system. The Association connects the Missouri Pacific, Missouri, Kansas & Texas, St. Louis & San Francisco, Wabash, etc., in St. Louis, and a large number of railroads in East St. Louis, and at present works about four miles of line. W. S. McChesney, Jr., St. Louis, Mo., is Vice-President and General Manager.

Tishomingo-Denison (Electric).—An officer of the company organized to build between these points is quoted as saying that the necessary funds have been raised and that building is in prospect. The line is designed to carry both freight and passengers and will be 45 miles long.

Trinity & Brazos Valley.—An officer is quoted as saying that the necessary funds to build this projected line, without issue of bonds, have been raised and that the Southwestern Loan & Trust Co., recently organized, will finance the work. It is proposed to build northwest and southeast from Hillsboro, Texas, aggregating 300 miles. J. H. B. House, of Houston, is President.

Wellsburg, Steubenville & New Cumberland (Electric).—This company has asked a franchise for the line to be built from Wellsburg, W. Va., to Holidays Cove. S. George, of Wellsburg, W. Va., may be addressed.

Western Maryland.—Condemnation proceedings against property on the projected route to tidewater were begun by the Western Maryland Tidewater Co. on Nov. 19. It is proposed to build a line 12 miles long, leaving the Western Maryland at Howardsville and passing under the Baltimore & Ohio and Pennsylvania. Surveys were made last spring.

West Virginia Roads.—Press reports state that the Chieftain Coal & Coke Co., which owns a large tract of coal lands near Wilsonburg, W. Va., has begun surveys for a new line seven miles long to connect with the Baltimore & Ohio and the West Virginia Short Line at Sardis.

Wolf Creek.—This company has been incorporated in Kentucky to build a railroad about 20 miles long in the vicinity of Wolf Creek, connecting with the Norfolk & Western near Warfield. The names of interested parties are not stated.

GENERAL RAILROAD NEWS.

Atlantic Coast Line.—At a meeting of the shareholders on Nov. 17, it was voted to increase the common stock from $23,150,000 to $38,150,000. The bonded debt will also be increased by the issue of $35,000,000 collateral trust purchase money 50 year 4s, with which $30,600,000 of the $60,000,000 capital stock of the Louisville & Nashville will be taken over.

A reply to the complaint of the Kentucky State Railroad Commission has been filed with the Interstate Commerce Commission at Washington. The Coast Line disclaims knowledge of the complaint that plans are being made to put all the railroad traffic of the South under one control, but admits the details of the arrangement in accordance with which J. P. Morgan & Co. will deliver to it 306,000 shares of Louisville & Nashville by Dec. 31 next, for a consideration of $50,000,000.

Birmingham Belt.—The $1,000,000 4 per cent. 20 year gold bonds of Oct. 1, 1902, are offered by H. W. Poor & Co., of Boston, at 96. These bonds are subject to call at 102½, and are guaranteed, principal and interest, by the Kansas City, Memphis & Birmingham and the St. Louis & San Francisco. The Birmingham Belt operates about 16 miles of track, reaching 34 industries.

Bradford, Bordell & Kinzua.—Notice is given that the lease between the Pittsburgh & Western and the above, for a portion of the Pittsburgh & Western line between Foxburg and Kane, Pa., will terminate Dec. 1, after which time this portion of the Pittsburgh & Western will be worked by the Baltimore & Ohio, although the Bradford, Bordell & Kinzua will continue to work that portion of the Pittsburgh & Western between Kane and Mount Jewett. The line is 104 miles long and is narrow gage. (Nov. 8, p. 782.)

Champaign & Southeastern.—Judge Humphrey in the United States Circuit Court at St. Louis, Nov. 7, issued a decree of foreclosure against this line and ordered its sale. It is a spur of the Wabash which runs from Sydney to Champaign, Ill., 12 miles, and is in default of bonds which amount to $400,000.

Chicago, Rock Island & Mexico.—The Texas Railroad Commission on Nov. 12 granted the application to issue bonds on 92 miles of its road running into New Mexico. The Commission appraised the road at $20,000 a mile and bonds may be issued after the stock has been deducted from that valuation.

Jackson & Battle Creek Traction Co.—See Railroad Construction.

Lehigh Valley.—Press reports state that the Girard Trust Co. will handle this company's entire coal business for the next five years, and that arrangements have been made to issue $3,000,000 of 5 per cent. coal trust certificates, which will be taken by the Girard Trust Co. The latter will retain as collateral, 75 per cent. of the selling price of the coal. At the expiration of the five years period, renewal of the bonds will be optional with the railroad company. It is said the directors have authorized the issuance of such certificates.

Louisville & Nashville.—A deal for the purchase of the Yellow River R. R., which runs from Crest View, Fla., to Florala, Ala., 27 miles, with a five-mile branch, is reported confirmed by a stockholder. It will afford the Louisville & Nashville direct connection with its Opp and Geneva branches, which are just being completed. Connection with the Louisville & Nashville is made at Crest View.

Manhattan Railway (New York).—It seems probable that negotiations are being made by which this property is to be transferred to the Interborough Rapid Transit. Considerable comment has been made by the press, but it is not likely that terms have as yet been fixed for any such transfer.

New Orleans & Northwestern.—This railroad, which runs from Natchez through Winnsboro, Rayville and Bastrop to the Arkansas line, 99 miles, was reported in our issue of Oct. 3 as sold at public auction on Sept. 21. It has now been reorganized by the purchasers into a corporation called the New Orleans & Northwestern *Railroad*. The termination of the former title was *Railway*. The line now forms a part of the Gould route between New Orleans and St. Louis. E. T. Jeffry, of New York, is President, and Russell Harding, of St. Louis, is Vice-President. (Oct. 3, p. 766.)

Richmond & Petersburg Traction.—This electric line, which runs between the points named in Virginia, 22 miles, was sold Nov. 13 to the Virginia Passenger & Power Co., of Richmond, Va. The price paid was $550,000.

St. Louis, Memphis & Southeastern.—An officer is quoted as saying that the sale of this company's stock to the St. Louis & San Francisco was concluded on Nov. 17 at the rate of $47.50. This stock aggregates $12,500,000 par value, and was deposited with the Eastern Trust Co. of New York, to secure an issue of 40-year collateral trust notes which are a direct obligation to the St. Louis & San Francisco and amount to $4,000,000 par value. The St. Louis, Memphis & Southeastern now operates a line from Cape Girardeau, Mo., to Pocahontas, 114 miles, with a branch from Mingo to Hunter, 45 miles; and also a line from Paw Paw Junction to Luxora, Ark., 72 miles. Two short branches add 26 miles to the total. Newman Erb is trustee for the stockholders. The St. Louis, Memphis & Southeastern affords the Frisco System the shortest line between the territory in the vicinity of Birmingham, Ala., and St. Louis.

Southern Pacific.—It is understood that this company has purchased a large interest in the Saratoga oil field northwest of Beaumont, Texas, and will build a branch line to reach it. The property contains two flowing wells and gives absolute title to about 25 acres.